1.1.1 Curricula developed and implemented have relevance to the local/ national / regional and global developmental needs which are reflected in Programme Outcomes (PSOs) and Course Outcomes (COs) of various programmes offered by the Institution

S. No.	Course Code	Name of the Course	L	N	R	G	POs	PSOs	COs
							POs, PSOs, COs Addressed		
							POs	**PSOs**	**COs**
							2023-2024		
1	MU231CC1	Core Course I: Algebra and Trigonometry		☑			PO 1 - To obtain comprehensive knowledge and skills to pursue higher studies in the relevant field of science. PO 4 - To enhance leadership qualities, team spirit and communication skills to face challenging competitive examinations for a better developmental career.	PSO 1 - To acquire good knowledge and understanding, to solve specific theoretical & applied problems in different area of mathematics & statistics. PSO 3 - To apply Mathematical theories and principles accurately, precisely and effectively including higher research and extensions.	CO 1 - To classify and solve reciprocal equations. CO 2 - To find the sum of binomial, exponential and logarithmic series. CO 3 - To find Eigen values, eigen vectors, verify Cayley — Hamilton theorem and diagonalize a given matrix. CO 4 - To expand the powers and multiples of trigonometric functions in terms of sine and cosine. CO 5 - To determine relationship between circular and hyperbolic functions and the summation of trigonometric series.
2	MU231CC2	Core Course II: Differential Calculus		☑			PO 1 - To obtain comprehensive knowledge and skills to pursue higher studies in the relevant field of science. PO 3 - To reflect upon green initiatives and take responsible steps to build a sustainable environment. PO 6 - To absorb ethical, moral and social values in personal and social life leading to highly cultured and civilized personality. PO 7 - To participate in learning activities throughout life , through self-paced and self-directed learning to develop knowledge and skills.	PSO 1 - To acquire good knowledge and understanding, to solve specific theoretical & applied problems in different area of mathematics & statistics. PSO 2 - To understand, formulate, develop mathematical arguments, logically and use quantitative models to address issues arising in social sciences, business and other context /fields. PSO 3 - To apply Mathematical theories and principles accurately, precisely and effectively including higher research and extensions.	CO 1 - To recall the definitions and basic concepts of Differential Calculus. CO 2 - To understand the concepts of Differentiation, Partial Differentiation, Envelope & Curvature. CO 3 - To determine Partial derivatives of a function of two variables and use Lagrange's method of undetermined multipliers. CO 4 - To distinguish between partial and ordinary differential equations. CO 5 - To find the evolutes and involutes and to find the radius of curvature using polar co-ordinates.
3	MU231EC1	Elective Course I: Algebra and Differential Equations		☑			PO 1 - To obtain comprehensive knowledge and skills to pursue higher studies in the relevant field of science. PO 4 - To enhance leadership qualities, team spirit and communication skills to face challenging competitive examinations for a better developmental career.	PSO 1 - To acquire good knowledge and understanding, to solve specific theoretical & applied problems in different area of mathematics & statistics. PSO 3 - To apply Mathematical theories and principles accurately, precisely and effectively including higher research and extensions.	CO 1 - To recall the methods of finding the solutions of algebraic equations, Differential equations and various formulae of Laplace transform. CO 2 - To understand thetheoryof algebraic equations, eigen values, differential equations and Laplace transform. CO 3 - To simplify algebraic expressions using various methods,find eigen values, solve initial value problems for ODEs and find inverse Laplace Transform. CO 4 - To analyse various types of first-order ODEs, relate Laplace transform and inverse Laplace transform and formulate algebraic equations from real world problems.
4	MU231NM1	Non Major Elective NME I: Mathematics for Competitive Examinations I			☑		PO 1 - To obtain comprehensive knowledge and skills to pursue higher studies in the relevant field of science. PO 2 - To create innovative ideas to enhance entrepreneurial skills for economic independence. PO 3 - To reflect upon green initiatives and take responsible steps to build a sustainable environment. PO 4 - To enhance leadership qualities, team spirit and communication skills to face challenging competitive examinations for a better developmental career. PO 5 - To communicate effectively and collaborate successfully with peers to become competent professionals. PO 6 - To absorb ethical, moral and social values in personal and social life leading to highly cultured and civilized personality. PO 7 - To participate in learning activities throughout life , through self-paced and self-directed learning to develop knowledge and skills.	PSO 1 - To acquire good knowledge and understanding, to solve specific theoretical & applied problems in different area of mathematics & statistics. PSO 2 - To understand, formulate, develop mathematical arguments, logically and use quantitative models to address issues arising in social sciences, business and other context /fields. PSO 3 - To apply Mathematical theories and principles accurately, precisely and effectively including higher research and extensions. PSO 4 - To prepare the students who will demonstrate respectful engagement with other's ideas, behaviors, beliefs and apply diverse frames of references to decisions and actions. PSO 5 - To create effective entrepreneurs by enhancing their critical thinking, problem solving, decision making and leadership skill that will facilitate startups and high potential organizations.	CO 1 - To understand the problems and remember the methods to solve problems. CO 2 - To grasp the simplest method to solve problems. CO 3 - To apply suitable mathematical method and get solutions to simple real life problems.

#	Code	Course			PO	PSO	CO
5	MU231FC1	Foundation Course: Bridge Mathematics	☑		PO 1 - To obtain comprehensive knowledge and skills to pursue higher studies in the relevant field of science. PO 2 - To create innovative ideas to enhance entrepreneurial skills for economic independence. PO 3 - To reflect upon green initiatives and take responsible steps to build a sustainable environment. PO 4 - To enhance leadership qualities, team spirit and communication skills to face challenging competitive examinations for a better developmental career. PO 5 - To communicate effectively and collaborate successfully with peers to become competent professionals. PO 6 - To absorb ethical, moral and social values in personal and social life leading to highly cultured and civilized personality. PO 7 - To participate in learning activities throughout life , through self-paced and self-directed learning to develop knowledge and skills.	PSO 1 - To acquire good knowledge and understanding, to solve specific theoretical & applied problems in different area of mathematics & statistics. PSO 2 - To understand, formulate, develop mathematical arguments, logically and use quantitative models to address issues arising in social sciences, business and other context /fields. PSO 3 - To apply Mathematical theories and principles accurately, precisely and effectively including higher research and extensions. PSO 4 - To prepare the students who will demonstrate respectful engagement with other's ideas, behaviors, beliefs and apply diverse frames of references to decisions and actions. PSO 5 - To create effective entrepreneurs by enhancing their critical thinking, problem solving, decision making and leadership skill that will facilitate startups and high potential organizations.	CO 1 - To prove the binomial theorem and apply it to find the expansions of any $(x + y)n$ and also, solve the related problems. CO 2 - To find the various sequences and series and solve the problems related to them. Explain the principle of counting. CO 3 - To find the number of permutations and combinations in different cases. Apply the principle of counting to solve the problems on permutations and combinations. CO 4 - To explain various trigonometric ratios and find them for different angles, including sum of the angles, multiple and submultiple angles, etc. Also, they can solve the problems using the transformations. CO 5 - To find the limit and derivative of a function at a point, the definite and indefinite integral of a function. Find the points of min/max of a function.
6	MU232CC1	Core Course III: Coordinate and Spatial Geometry	☑		PO 1 - To obtain comprehensive knowledge and skills to pursue higher studies in the relevant field of science. PO 3 - To reflect upon green initiatives and take responsible steps to build a sustainable environment. PO 6 - To absorb ethical, moral and social values in personal and social life leading to highly cultured and civilized personality. PO 7 - To participate in learning activities throughout life , through self-paced and self-directed learning to develop knowledge and skills.	PSO 1 - To acquire good knowledge and understanding, to solve specific theoretical & applied problems in different area of mathematics & statistics. PSO 2 - To understand, formulate, develop mathematical arguments, logically and use quantitative models to address issues arising in social sciences, business and other context /fields. PSO 3 - To apply Mathematical theories and principles accurately, precisely and effectively including higher research and extensions.	CO 1 - To recall the definitions and formulae of key concepts in coordinate and spatial geometry. CO 2 - To describe the relationships between geometric shapes and their equations and summarize the properties of different transformations on the coordinate plane. CO 3 - To solve real world problems involving lines, planes and spheres using analytical geometry concepts. CO 4 - To analyze the properties of equations of lines, planes and spheres. CO 5 - To evaluate complex problems that require the application of coordinate and spatial geometry concepts.
7	MU232CC2	Core Course IV: Integral Calculus	☑		PO 1 - To obtain comprehensive knowledge and skills to pursue higher studies in the relevant field of science. PO 3 - To reflect upon green initiatives and take responsible steps to build a sustainable environment. PO 6 - To absorb ethical, moral and social values in personal and social life leading to highly cultured and civilized personality. PO 7 - To participate in learning activities throughout life , through self-paced and self-directed learning to develop knowledge and skills.	PSO 1 - To acquire good knowledge and understanding, to solve specific theoretical & applied problems in different area of mathematics & statistics. PSO 2 - To understand, formulate, develop mathematical arguments, logically and use quantitative models to address issues arising in social sciences, business and other context /fields. PSO 3 - To apply Mathematical theories and principles accurately, precisely and effectively including higher research and extensions.	CO 1 - To determine the integrals of algebraic, trigonometric and logarithmic functions and to find the reduction formulae. CO 2 - To evaluate double and triple integrals and problems using change of order of integration. CO 3 - To solve multiple integrals and to find the areas of curved surfaces and volumes of solids of revolution. CO 4 - To explain beta and gamma function sand to use them in solving problems of integration. CO 5 - To explain Geometric and Physical applications of integral calculus.
8	MU232EC1	Elective Course II: Vector Calculus and Fourier Series	☑		PO 1 - To obtain comprehensive knowledge and skills to pursue higher studies in the relevant field of science. PO 3 - To reflect upon green initiatives and take responsible steps to build a sustainable environment. PO 6 - To absorb ethical, moral and social values in personal and social life leading to highly cultured and civilized personality. PO 7 - To participate in learning activities throughout life , through self-paced and self-directed learning to develop knowledge and skills.	PSO 1 - To acquire good knowledge and understanding, to solve specific theoretical & applied problems in different area of mathematics & statistics. PSO 2 - To understand, formulate, develop mathematical arguments, logically and use quantitative models to address issues arising in social sciences, business and other context /fields. PSO 3 - To apply Mathematical theories and principles accurately, precisely and effectively including higher research and extensions.	CO 1 - To remember the formulae of vector differentiation, integration and Fourier series. CO 2 - To understand various theorems related to vector differentiation, integration and Beta, Gamma functions. CO 3 - To solve problems on vector differentiation, integration, Beta, Gamma functions and Fourier series. CO 4 - To compare double and triple integrals, line, surface integrals, Beta, Gamma functions and Fourier series for Even and odd functions. CO 5 - To apply double and triple integrals and vector differentiation in calculating area and volume.
9	MU232NM1	Non-major Elective NME II: Mathematics For Competitive Examinations- II		☑	PO 1 - To obtain comprehensive knowledge and skills to pursue higher studies in the relevant field of science. PO 3 - To reflect upon green initiatives and take responsible steps to build a sustainable environment. PO 7 - To participate in learning activities throughout life , through self-paced and self-directed learning to develop knowledge and skills.	PSO 1 - To acquire good knowledge and understanding, to solve specific theoretical & applied problems in different area of mathematics & statistics. PSO 3 - To apply Mathematical theories and principles accurately, precisely and effectively including higher research and extensions.	CO 1 - To understand the problems and remember the methods to solve problems. CO 2 - To identify the appropriate method to solve problems. CO 3 - To apply the best mathematical method and obtain the solution in short. CO 4 - To apply fundamental mathematical concepts to calculate simple interest, compound interest. CO 5 - To develop problem-solving skills and critical thinking by effectively solving real-world scenarios involving financial calculation.

#	Code	Course				PO	PSO	CO
10	MU232SE1	Skill Enhancement Course SEC I: Introduction to Computational Mathematics			☑	PO 1 - To obtain comprehensive knowledge and skills to pursue higher studies in the relevant field of science. PO 3 - To reflect upon green initiatives and take responsible steps to build a sustainable environment. PO 6 - To absorb ethical, moral and social values in personal and social life leading to highly cultured and civilized personality. PO 7 - To participate in learning activities throughout life , through self-paced and self-directed learning to develop knowledge and skills.	PSO 1 - To acquire good knowledge and understanding, to solve specific theoretical & applied problems in different area of mathematics & statistics. PSO 2 - To understand, formulate, develop mathematical arguments, logically and use quantitative models to address issues arising in social sciences, business and other context /fields. PSO 3 - To apply Mathematical theories and principles accurately, precisely and effectively including higher research and extensions.	CO 1 - To gain an appreciation for the role of computers in mathematics, science, and engineering as a complement to analytical and experimental approaches. CO 2 - To acquire a strong foundation in numerical analysis, enabling students to evaluate and analyze numerical solutions for mathematical problems. CO 3 - To use and evaluate alternative numerical methods for the solution of systems of equations. CO 4 - To foster critical thinking skills in assessing computational methods for problem solving. CO 5 - To apply mathematical concepts to practical problems through computational approaches.
11	MC2031	Major Core III: Differential Equations and Vector Calculus	☑			PO 1 - To equip students with hands on training through various courses to enhance entrepreneurship skills. PO 2 - To impart communicative skills and ethical values. PO 3 - To face challenging competitive examinations that offer rewarding careers in science and education. PO 4 - To apply the acquired scientific knowledge to face day to day needs and reflect upon green initiatives to build a sustainable environment.	PSO 1 - To acquire a strong foundation in various branches of mathematics to formulate real life problems into mathematical models. PSO 2 - To apply the mathematical knowledge and skills to develop problem solving skills cultivating logical thinking and face competitive examinations with confidence. PSO 3 - To develop entrepreneurial skills based on ethical values, become empowered and self-dependent in society. PSO 4 - To enhance numerical ability and address problems in interdisciplinary areas which would help in project and field works.	CO 1 - To distinguish linear, nonlinear, ordinary and partial differential equations. CO 2 - To solve linear differential equations with constant and variable coefficients. CO 3 - To explain the basic properties of Laplace Transforms and Inverse Laplace Transforms. CO 4 - To use the Laplace transform to find the solution of linear differential equations. CO 5 - To learn methods of forming and solving partial differential equations. CO 6 - To learn differentiation and integration of vector valued functions. CO 7 - To evaluate line and surface integrals using Green's theorem, Stoke's theorem and Gauss divergence theorem. CO 8 - To apply the concepts to solve problems in physical sciences and engineering.
12	MC2032	Major Core IV: Real Analysis I	☑			PO 1 - To equip students with hands on training through various courses to enhance entrepreneurship skills. PO 3 - To face challenging competitive examinations that offer rewarding careers in science and education. PO 4 - To apply the acquired scientific knowledge to face day to day needs and reflect upon green initiatives to build a sustainable environment.	PSO 1 - To acquire a strong foundation in various branches of mathematics to formulate real life problems into mathematical models. PSO 2 - To apply the mathematical knowledge and skills to develop problem solving skills cultivating logical thinking and face competitive examinations with confidence. PSO 4 - To enhance numerical ability and address problems in interdisciplinary areas which would help in project and field works. PSO 5 - To pursue scientific research and develop new findings with global impact using latest technologies.	CO 1 - To understand the basic concepts of real numbers. CO 2 - To explain and analyse the primary concepts of sequences and series of real numbers. CO 3 - To define convergence and divergence of sequences and series. CO 4 - To calculate the limit points, upper and lower limits of the sequences. CO 5 - To evaluate the convergence of series using different types of tests. CO 6 - To develop the skill of analyzing various sequence and series.
13	MA2031	Allied III: Probability Theory and Distributions	☑			PO 1 - To equip students with hands on training through various courses to enhance entrepreneurship skills. PO 2 - To impart communicative skills and ethical values. PO 3 - To face challenging competitive examinations that offer rewarding careers in science and education. PO 4 - To apply the acquired scientific knowledge to face day to day needs and reflect upon green initiatives to build a sustainable environment.	PSO 1 - To acquire a strong foundation in various branches of mathematics to formulate real life problems into mathematical models. PSO 2 - To apply the mathematical knowledge and skills to develop problem solving skills cultivating logical thinking and face competitive examinations with confidence. PSO 3 - To develop entrepreneurial skills based on ethical values, become empowered and self-dependent in society. PSO 4 - To enhance numerical ability and address problems in interdisciplinary areas which would help in project and field works. PSO 5 - To pursue scientific research and develop new findings with global impact using latest technologies.	CO 1 - To recall the definition of probability and set functions. CO 2 - To differentiate between probability and conditional probability and compute according to the requirement. CO 3 - To understand the definition of random variables, their types and related concepts. CO 4 - To detect the different probability distributions which are widely used. CO 5 - To apply the techniques to prove the properties of probability and related distributions. CO 6 - To choose the suitable probability distribution corresponding to a given data. CO 7 - To test the validity of a given data.
14	MS20S1	Self-Learning Course: Discrete Mathematics I	☑			PO 1 - To equip students with hands on training through various courses to enhance entrepreneurship skills. PO 2 - To impart communicative skills and ethical values. PO 3 - To face challenging competitive examinations that offer rewarding careers in science and education. PO 4 - To apply the acquired scientific knowledge to face day to day needs and reflect upon green initiatives to build a sustainable environment.	PSO 1 - To acquire a strong foundation in various branches of mathematics to formulate real life problems into mathematical models. PSO 2 - To apply the mathematical knowledge and skills to develop problem solving skills cultivating logical thinking and face competitive examinations with confidence. PSO 3 - To develop entrepreneurial skills based on ethical values, become empowered and self-dependent in society. PSO 4 - To enhance numerical ability and address problems in interdisciplinary areas which would help in project and field works.	CO 1 - To understand the basic principles of relations and its examples. CO 2 - To analyze various basic logical laws in Calculus and its properties. CO 3 - To develop the ability to solve problems in functions. CO 4 - To analyze real life problems using graph theory both quantitatively and qualitatively.

#	Code	Course				PO	PSO	CO
15	MC2041	Major Core V: Groups and Rings	☑			PO 1 - To equip students with hands on training through various courses to enhance entrepreneurship skills. PO 3 - To face challenging competitive examinations that offer rewarding careers in science and education. PO 4 - To apply the acquired scientific knowledge to face day to day needs and reflect upon green initiatives to build a sustainable environment.	PSO 1 - To acquire a strong foundation in various branches of mathematics to formulate real life problems into mathematical models. PSO 2 - To apply the mathematical knowledge and skills to develop problem solving skills cultivating logical thinking and face competitive examinations with confidence. PSO 4 - To enhance numerical ability and address problems in interdisciplinary areas which would help in project and field works. PSO 5 - To pursue scientific research and develop new findings with global impact using latest technologies.	CO 1 - To recall the definitions of groups ,rings, functions and also examples of groups and rings. CO 2 - To explain the properties of groups, rings and different types of groups and rings. CO 3 - To develop proofs of results on Permutation groups ,Cyclic groups, Quotient group, Subgroups, sub rings , quotient rings. CO 4 - To examine the properties of Ideals-Maximal and Prime ideals-Cosets-order of an element. CO 5 - To test the homomorphic and isomorphic properties of groups and rings. CO 6 - To develop the concepts of ordered integral domains and Unique Factorization Domains. CO 7 - To apply the theory of Groups and Rings and solve problems.
16	MC2042	Major Core VI: Analytical Geometry of 3 Dimensions	☑			PO 1 - To equip students with hands on training through various courses to enhance entrepreneurship skills. PO 2 - To impart communicative skills and ethical values. PO 3 - To face challenging competitive examinations that offer rewarding careers in science and education. PO 4 - To apply the acquired scientific knowledge to face day to day needs and reflect upon green initiatives to build a sustainable environment.	PSO 1 - To acquire a strong foundation in various branches of mathematics to formulate real life problems into mathematical models. PSO 2 - To apply the mathematical knowledge and skills to develop problem solving skills cultivating logical thinking and face competitive examinations with confidence. PSO 3 - To develop entrepreneurial skills based on ethical values, become empowered and self-dependent in society. PSO 4 - To enhance numerical ability and address problems in interdisciplinary areas which would help in project and field works. PSO 5 - To pursue scientific research and develop new findings with global impact using latest technologies.	CO 1 - To recall the basic definitions and concepts of planes and lines. CO 2 - To demonstrate the projection of the line joining two points, cosines of the line joining two points and will be able to solve problems. CO 3 - To calculate the distance between points, planes and the angles between lines and planes. CO 4 - To draw three dimensional surfaces from the given information. CO 5 - To discuss the characteristics and properties of 3 - dimensional objects like sphere, cube, cone etc. CO 6 - To develop the skill in 3 - dimensional geometry to gain mastery in related courses.
17	MA2041	Allied IV: Applied Statistics	☑			PO 1 - To equip students with hands on training through various courses to enhance entrepreneurship skills. PO 2 - To impart communicative skills and ethical values. PO 3 - To face challenging competitive examinations that offer rewarding careers in science and education. PO 4 - To apply the acquired scientific knowledge to face day to day needs and reflect upon green initiatives to build a sustainable environment.	PSO 1 - To acquire a strong foundation in various branches of mathematics to formulate real life problems into mathematical models. PSO 2 - To apply the mathematical knowledge and skills to develop problem solving skills cultivating logical thinking and face competitive examinations with confidence. PSO 3 - To develop entrepreneurial skills based on ethical values, become empowered and self-dependent in society. PSO 4 - To enhance numerical ability and address problems in interdisciplinary areas which would help in project and field works. PSO 5 - To pursue scientific research and develop new findings with global impact using latest technologies.	CO 1 - To identify and demonstrate appropriate sampling processes. CO 2 - To recall the methods of classifying and analyzing data relative to single variable. CO 3 - To describe the χ^2 distribution in statistics. CO 4 - To distinguish between the practical purposes of a large and a small sample. CO 5 - To understand that correlation coefficient is independent of the change of origin and scale.
18	MS20S2	Self-Learning Course: Discrete Mathematics II	☑			PO 1 - To equip students with hands on training through various courses to enhance entrepreneurship skills. PO 2 - To impart communicative skills and ethical values. PO 3 - To face challenging competitive examinations that offer rewarding careers in science and education. PO 4 - To apply the acquired scientific knowledge to face day to day needs and reflect upon green initiatives to build a sustainable environment.	PSO 1 - To acquire a strong foundation in various branches of mathematics to formulate real life problems into mathematical models. PSO 2 - To apply the mathematical knowledge and skills to develop problem solving skills cultivating logical thinking and face competitive examinations with confidence. PSO 3 - To develop entrepreneurial skills based on ethical values, become empowered and self-dependent in society. PSO 4 - To enhance numerical ability and address problems in interdisciplinary areas which would help in project and field works.	CO 1 - To know various types of lattices and analyze its properties. CO 2 - To understand the basic principles of Boolean Algebra. CO 3 - To interpret matrices and apply these concepts to find solutions of a system of linear equations. CO 4 - To use combinatorics for suitable applications.
19	MC2051	Major Core VII: Linear Algebra	☑			PO 1 - To equip students with hands on training through various courses to enhance entrepreneurship skills. PO 2 - To impart communicative skills and ethical values. PO 3 - To face challenging competitive examinations that offer rewarding careers in science and education. PO 4 - To apply the acquired scientific knowledge to face day to day needs and reflect upon green initiatives to build a sustainable environment.	PSO 1 - To acquire a strong foundation in various branches of mathematics to formulate real life problems into mathematical models. PSO 2 - To apply the mathematical knowledge and skills to develop problem solving skills cultivating logical thinking and face competitive examinations with confidence. PSO 3 - To develop entrepreneurial skills based on ethical values, become empowered and self-dependent in society.	CO 1 - To recall and define Groups, Fields and their properties. CO 2 - To cite examples of vector spaces ,subspaces and linear transformations. CO 3 - To determine the concepts of linear independence, linear dependence , basis and dimension of vector spaces. CO 4 - To correlate rank and nullity ,Linear transformation and matrix of a Linear transformation. CO 5 - To examine whether a given space is an inner product space and the orthonormality of sets.

No	Code	Course					PO	PSO	CO
20	MC2052	Major Core VIII: Real Analysis II		☑			PO 1 - To equip students with hands on training through various courses to enhance entrepreneurship skills. PO 2 - To impart communicative skills and ethical values. PO 3 - To face challenging competitive examinations that offer rewarding careers in science and education. PO 4 - To apply the acquired scientific knowledge to face day to day needs and reflect upon green initiatives to build a sustainable environment.	PSO 1 - To acquire a strong foundation in various branches of mathematics to formulate real life problems into mathematical models. PSO 2 - To apply the mathematical knowledge and skills to develop problem solving skills cultivating logical thinking and face competitive examinations with confidence. PSO 3 - To develop entrepreneurial skills based on ethical values, become empowered and self-dependent in society. PSO 4 - To enhance numerical ability and address problems in interdisciplinary areas which would help in project and field works. PSO 5 - To pursue scientific research and develop new findings with global impact using latest technologies.	CO 1 - To understand the concepts of completeness, continuity and discontinuity of metric spaces. CO 2 - To apply the metric space theorems to real life situations. CO 3 - To distinguish between continuous functions and uniform continuous functions. CO 4 - To use basic concepts in the development of real analysis results. CO 5 - To understand the concepts of metric space, connectedness and compactness of metric spaces. CO 6 - To develop the ability to reflect on problems that are quite significant in the field of analysis.
21	MC2053	Major Core IX: Compter Oriented Numerical Methods				☑	PO 1 - To equip students with hands on training through various courses to enhance entrepreneurship skills. PO 2 - To impart communicative skills and ethical values. PO 3 - To face challenging competitive examinations that offer rewarding careers in science and education. PO 4 - To apply the acquired scientific knowledge to face day to day needs and reflect upon green initiatives to build a sustainable environment.	PSO 1 - To acquire a strong foundation in various branches of mathematics to formulate real life problems into mathematical models. PSO 2 - To apply the mathematical knowledge and skills to develop problem solving skills cultivating logical thinking and face competitive examinations with confidence. PSO 3 - To develop entrepreneurial skills based on ethical values, become empowered and self-dependent in society. PSO 4 - To enhance numerical ability and address problems in interdisciplinary areas which would help in project and field works. PSO 5 - To pursue scientific research and develop new findings with global impact using latest technologies.	CO 1 - To understand the elementary programming language and its structure. CO 2 - To develop computer programmes for the solution of various numerical problems. CO 3 - To apply numerical methods to obtain approximate solutions to mathematical problems. CO 4 - To employ different methods of constructing a polynomial using various methods. CO 5 - To compare the rate of convergence of different numerical formula. CO 6 - To distinguish the advantages and disadvantages of various numerical methods.
22	MC2054	Major: Project	☑	☑	☑	☑	PO 1 - To equip students with hands on training through various courses to enhance entrepreneurship skills. PO 2 - To impart communicative skills and ethical values. PO 4 - To apply the acquired scientific knowledge to face day to day needs and reflect upon green initiatives to build a sustainable environment.	PSO 1 - To acquire a strong foundation in various branches of mathematics to formulate real life problems into mathematical models. PSO 3 - To develop entrepreneurial skills based on ethical values, become empowered and self-dependent in society. PSO 4 - To enhance numerical ability and address problems in interdisciplinary areas which would help in project and field works. PSO 5 - To pursue scientific research and develop new findings with global impact using latest technologies.	CO 1 - To choose a new topic of their interest. CO 2 - To develop the attitude of studying a topic in depth independently. CO 3 - To express their views with confidence in a group. CO 4 - To relate with the group members and reap the best harvest. CO 5 - To develop communication skills through oral presentation. CO 6 - To create a taste for research in mathematics. CO 7 - To develop confidence to face interviews. CO 8 - To interpret and analyze data mathematically.
23	MC2055	Elective I: a) Graph Theory		☑			PO 1 - To equip students with hands on training through various courses to enhance entrepreneurship skills. PO 2 - To impart communicative skills and ethical values. PO 3 - To face challenging competitive examinations that offer rewarding careers in science and education. PO 4 - To apply the acquired scientific knowledge to face day to day needs and reflect upon green initiatives to build a sustainable environment.	PSO 1 - To acquire a strong foundation in various branches of mathematics to formulate real life problems into mathematical models. PSO 2 - To apply the mathematical knowledge and skills to develop problem solving skills cultivating logical thinking and face competitive examinations with confidence. PSO 3 - To develop entrepreneurial skills based on ethical values, become empowered and self-dependent in society. PSO 4 - To enhance numerical ability and address problems in interdisciplinary areas which would help in project and field works.	CO 1 - To understand the basic definitions to write the proofs of simple theorems. CO 2 - To employ the definitions to write the proofs of simple theorems. CO 3 - To relate real life situations with mathematical graphs. CO 4 - To develop the ability to solve problems in graph theory. CO 5 - To analyze real life problems using graph theory both quantitatively and qualitatively.
24	MC2056	Elective I: b) Fuzzy Mathematics		☑		☑	PO 1 - To equip students with hands on training through various courses to enhance entrepreneurship skills. PO 2 - To impart communicative skills and ethical values. PO 3 - To face challenging competitive examinations that offer rewarding careers in science and education. PO 4 - To apply the acquired scientific knowledge to face day to day needs and reflect upon green initiatives to build a sustainable environment.	PSO 1 - To acquire a strong foundation in various branches of mathematics to formulate real life problems into mathematical models. PSO 2 - To apply the mathematical knowledge and skills to develop problem solving skills cultivating logical thinking and face competitive examinations with confidence. PSO 3 - To develop entrepreneurial skills based on ethical values, become empowered and self-dependent in society. PSO 4 - To enhance numerical ability and address problems in interdisciplinary areas which would help in project and field works.	CO 1 - To understand the basic mathematical operations carried out on fuzzy sets. CO 2 - To compare fuzzy sets with crisp sets. CO 3 - To explain classical logic and fuzzy logic. CO 4 - To describe the significance of fuzzy systems and genetic algorithms. CO 5 - To solve problems that are appropriately solved by neural networks, fuzzy logic and genetic algorithms. CO 6 - To apply the concepts fuzzy systems and neural networks in various fields like machine intelligence and robotics. CO 7 - To differentiate between Possibility theory and Probability theory.

#	Code	Title					PO	PSO	CO
25	MC2057	Elective I: c) Object Oriented Programming with C++				☑	PO 1 - To equip students with hands on training through various courses to enhance entrepreneurship skills. PO 2 - To impart communicative skills and ethical values. PO 3 - To face challenging competitive examinations that offer rewarding careers in science and education. PO 4 - To apply the acquired scientific knowledge to face day to day needs and reflect upon green initiatives to build a sustainable environment.	PSO 1 - To acquire a strong foundation in various branches of mathematics to formulate real life problems into mathematical models. PSO 2 - To apply the mathematical knowledge and skills to develop problem solving skills cultivating logical thinking and face competitive examinations with confidence. PSO 3 - To develop entrepreneurial skills based on ethical values, become empowered and self-dependent in society. PSO 4 - To enhance numerical ability and address problems in interdisciplinary areas which would help in project and field works. PSO 5 - To pursue scientific research and develop new findings with global impact using latest technologies.	CO 1 - To apply C++ features to program design and implementation CO 2 - To explain object oriented concepts and describe how they are supported by C++ CO 3 - To use C++ to demonstrate practical experience in developing object oriented solutions CO 4 - To design and implement programs using C++ CO 5 - To analyze a problem description and design object oriented software using good coding practices and techniques CO 6 - To implement an achievable practical applications and analyze issues related to object oriented techniques in the C++ programming language CO 7 - To use common software patterns in object oriented design and recognize their applicability to other software development contexts CO 8 - To create application using C++ programming language CO 9 - To write algorithm for programs
26	MC2061	Major Core X: Complex Analysis	☑				PO 1 - To equip students with hands on training through various courses to enhance entrepreneurship skills. PO 2 - To impart communicative skills and ethical values. PO 4 - To apply the acquired scientific knowledge to face day to day needs and reflect upon green initiatives to build a sustainable environment.	PSO 1 - To acquire a strong foundation in various branches of mathematics to formulate real life problems into mathematical models. PSO 3 - To develop entrepreneurial skills based on ethical values, become empowered and self-dependent in society. PSO 4 - To enhance numerical ability and address problems in interdisciplinary areas which would help in project and field works. PSO 5 - To pursue scientific research and develop new findings with global impact using latest technologies.	CO 1 - To understand the geometric representation of mappings CO 2 - To use differentiation rules to compute derivatives and express complex- differentiable functions as power series CO 3 - To compute line integrals by using Cauchy's integral theorem and formula CO 4 - To identify the isolated singularities of a function and determine whether they are removable, poles or essential CO 5 - To evaluate definite integrals by using residues theorem
27	MC2062	Major Core XI: Mechanics	☑				PO 1 - To equip students with hands on training through various courses to enhance entrepreneurship skills. PO 2 - To impart communicative skills and ethical values. PO 3 - To face challenging competitive examinations that offer rewarding careers in science and education. PO 4 - To apply the acquired scientific knowledge to face day to day needs and reflect upon green initiatives to build a sustainable environment.	PSO 1 - To acquire a strong foundation in various branches of mathematics to formulate real life problems into mathematical models. PSO 2 - To apply the mathematical knowledge and skills to develop problem solving skills cultivating logical thinking and face competitive examinations with confidence. PSO 3 - To develop entrepreneurial skills based on ethical values, become empowered and self-dependent in society. PSO 4 - To enhance numerical ability and address problems in interdisciplinary areas which would help in project and field works. PSO 5 - To pursue scientific research and develop new findings with global impact using latest technologies.	CO 1 - To calculate the reactions necessary to ensure static equilibrium. CO 2 - To apply the principles of static equilibrium to particles and rigid bodies. CO 3 - To understand the ways of distributing loads. CO 4 - To identify internal forces and moments of a rigid body. CO 5 - To apply the basic principles of projectiles into real world problems. CO 6 - To classify the laws of friction.
28	MC2063	Major Core XII: Number Theory	☑				PO 1 - To equip students with hands on training through various courses to enhance entrepreneurship skills. PO 2 - To impart communicative skills and ethical values. PO 3 - To face challenging competitive examinations that offer rewarding careers in science and education. PO 4 - To apply the acquired scientific knowledge to face day to day needs and reflect upon green initiatives to build a sustainable environment.	PSO 1 - To acquire a strong foundation in various branches of mathematics to formulate real life problems into mathematical models. PSO 2 - To apply the mathematical knowledge and skills to develop problem solving skills cultivating logical thinking and face competitive examinations with confidence. PSO 3 - To develop entrepreneurial skills based on ethical values, become empowered and self-dependent in society. PSO 4 - To enhance numerical ability and address problems in interdisciplinary areas which would help in project and field works. PSO 5 - To pursue scientific research and develop new findings with global impact using latest technologies.	CO 1 - To express the concepts and results of divisibility of integers effectively. CO 2 - To construct mathematical proofs of theorems and find counter examples for false statements. CO 3 - To collect and use numerical data to form conjectures about the integers. CO 4 - To understand the logic and methods behind the major proofs in Number Theory. CO 5 - To solve challenging problems related to Chinese remainder theorem effectively. CO 6 - To build up the basic theory of the integers from a list of axioms.
29	MC2064	Major Core XIII: Linear Programming	☑				PO 1 - To equip students with hands on training through various courses to enhance entrepreneurship skills. PO 2 - To impart communicative skills and ethical values. PO 4 - To apply the acquired scientific knowledge to face day to day needs and reflect upon green initiatives to build a sustainable environment.	PSO 1 - To acquire a strong foundation in various branches of mathematics to formulate real life problems into mathematical models. PSO 3 - To develop entrepreneurial skills based on ethical values, become empowered and self-dependent in society. PSO 4 - To enhance numerical ability and address problems in interdisciplinary areas which would help in project and field works.	CO 1 - To understand the methods of optimization and to solve the problems. CO 2 - To explain what is an LPP. CO 3 - To define how to formulate an LPP with linear constraints. CO 4 - To maximize the profit, minimize the cost, minimize the time in transportation problem , Travelling salesman problem, Assignment problem. CO 5 - To identify a problem in your locality, formulate it as an LPP and solve.
30	MC2065	Elective II: a) Astronomy				☑	PO 1 - To equip students with hands on training through various courses to enhance entrepreneurship skills. PO 3 - To face challenging competitive examinations that offer rewarding careers in science and education. PO 4 - To apply the acquired scientific knowledge to face day to day needs and reflect upon green initiatives to build a sustainable environment.	PSO 1 - To acquire a strong foundation in various branches of mathematics to formulate real life problems into mathematical models. PSO 2 - To apply the mathematical knowledge and skills to develop problem solving skills cultivating logical thinking and face competitive examinations with confidence. PSO 4 - To enhance numerical ability and address problems in interdisciplinary areas which would help in project and field works.	CO 1 - To define the spherical trigonometry of the celestial sphere. CO 2 - To discuss the Kepler's laws. CO 3 - To calculate the motion of two particles relative to the common mass centre. CO 4 - To interpret latitude and longitude and apply this to find the latitude and longitude of a particular place. CO 5 - To distinguish between Geometric Parallax and Horizontal Parallax.

#	Code	Course				PO	PSO	CO
31	MC2066	Elective II: b)Boolean Algebra		☑		PO 3 - To face challenging competitive examinations that offer rewarding careers in science and education. PO 4 - To apply the acquired scientific knowledge to face day to day needs and reflect upon green initiatives to build a sustainable environment.	PSO 1 - To acquire a strong foundation in various branches of mathematics to formulate real life problems into mathematical models. PSO 2 - To apply the mathematical knowledge and skills to develop problem solving skills cultivating logical thinking and face competitive examinations with confidence. PSO 5 - To pursue scientific research and develop new findings with global impact using latest technologies.	CO 1 - To discuss the primary concepts of Lattices and Boolean algebra. CO 2 - To recognize upper bound, lower bound, greatest lower bound. CO 3 - To differentiate between lattices and complete lattices. CO 4 - To relate the concepts of lattice homomorphism and isomorphism. CO 5 - To formulate problems in Lattices and Boolean Algebra.
32	MC2067	Elective II: c) Web Designing with HTML		☑		PO 1 - To equip students with hands on training through various courses to enhance entrepreneurship skills. PO 3 - To face challenging competitive examinations that offer rewarding careers in science and education. PO 4 - To apply the acquired scientific knowledge to face day to day needs and reflect upon green initiatives to build a sustainable environment.	PSO 1 - To acquire a strong foundation in various branches of mathematics to formulate real life problems into mathematical models. PSO 2 - To apply the mathematical knowledge and skills to develop problem solving skills cultivating logical thinking and face competitive examinations with confidence. PSO 4 - To enhance numerical ability and address problems in interdisciplinary areas which would help in project and field works.	CO 1 - To define modern protocols and systems used on the web(such as HTML,HTTP). CO 2 - To employ fundamental knowledge on web designing with makeup language. CO 3 - To gain strong knowledge in HTML. CO 4 - To use critical thinking skills to design and implement an interactive websites with regard to issues of usability, accessibility and internationalism. CO 5 - To pursue future courses in website development and design.
33	MSK206	Skill Enhancement Course: Mathematics for Competitive Examinations			☑	PO 1 - To equip students with hands on training through various courses to enhance entrepreneurship skills. PO 3 - To face challenging competitive examinations that offer rewarding careers in science and education. PO 4 - To apply the acquired scientific knowledge to face day to day needs and reflect upon green initiatives to build a sustainable environment.	PSO 1 - To acquire a strong foundation in various branches of mathematics to formulate real life problems into mathematical models. PSO 2 - To apply the mathematical knowledge and skills to develop problem solving skills cultivating logical thinking and face competitive examinations with confidence. PSO 4 - To enhance numerical ability and address problems in interdisciplinary areas which would help in project and field works.	CO 1 - To recall the problems on ages. CO 2 - To discuss the problems on profit and loss. CO 3 - To conversion of ratio into proportion and vice versa. CO 4 - To analyze the problems related to chain rule. CO 5 - To evaluate time and work related problems.
34	MP231CC1	Core Course I: Algebraic Structures			☑	PO 1 - To apply their knowledge, analyze complex problems, think independently, formulate and perform quality research. PO 2 - To carry out internship programmes and research projects to develop scientific and innovative ideas through effective communication. PO 3 - To develop a multidisciplinary perspective and contribute to the knowledge capital of the globe. PO 4 - To develop innovative initiatives to sustain ecofriendly environment. PO 5 - To through active career, team work and using managerial skills guide people to the right destination in a smooth and efficient way. PO 6 - To employ appropriate analysis tools and ICT in a range of learning scenarios, demonstrating the capacity to find, assess, and apply relevant information sources. PO 7 - To learn independently for lifelong executing professional, social and ethical responsibilities leading to sustainable development.	PSO 1 - To acquire good knowledge and understanding, to solve specific theoretical & applied problems in different area of mathematics & statistics. PSO 2 - To understand, formulate, develop mathematical arguments, logically and use quantitative models to address issues arising in social sciences, business and other context /fields. PSO 3 - To prepare the students who will demonstrate respectful engagement with other's ideas, behaviors, beliefs and apply diverse frames of references to decisions and actions. PSO 4 - To pursue scientific research and develop new findings with global impact using latest technologies.	CO 1 - To recall basic counting principle, define class equations to solve problems, explain Sylow's theorems and apply the theorem to find number of Sylow subgroups. CO 2 - To define Solvable groups, define direct products, examine the properties of finite abelian groups, define modules. CO 3 - To define similar Transformations, define invariant subspace, explore the properties of triangular matrix, to find the index of nilpotence to decompose a space into invariant subspaces, to find invariants of linear transformation, to explore the properties of nilpotenttransformation relating nilpotence with invariants. CO 4 - To define Jordan, canonical form, Jordan blocks, define rational canonical form, definecompanion matrix of polynomial, find the elementary devices of transformation, apply the concepts to find characteristic polynomial of linear transformation. CO 5 - To define trace, define transpose of a matrix, explain the properties of trace andtranspose, to find trace, to find transpose of matrix, to prove Jacobson lemma using thetriangular form, define symmetric matrix, skew symmetric matrix, adjoint, to defineHermitian, unitary, normal transformations and to Evaluate whether the transformation inHermitian, unitary and normal.
35	MP231CC2	Core Course II: Real Analysis I			☑	PO 1 - To apply their knowledge, analyze complex problems, think independently, formulate and perform quality research. PO 2 - To carry out internship programmes and research projects to develop scientific and innovative ideas through effective communication. PO 3 - To develop a multidisciplinary perspective and contribute to the knowledge capital of the globe. PO 4 - To develop innovative initiatives to sustain ecofriendly environment. PO 5 - To through active career, team work and using managerial skills guide people to the right destination in a smooth and efficient way. PO 6 - To employ appropriate analysis tools and ICT in a range of learning scenarios, demonstrating the capacity to find, assess, and apply relevant information sources. PO 7 - To learn independently for lifelong executing professional, social and ethical responsibilities leading to sustainable development.	PSO 1 - To acquire good knowledge and understanding, to solve specific theoretical & applied problems in different area of mathematics & statistics. PSO 2 - To understand, formulate, develop mathematical arguments, logically and use quantitative models to address issues arising in social sciences, business and other context /fields. PSO 3 - To prepare the students who will demonstrate respectful engagement with other's ideas, behaviors, beliefs and apply diverse frames of references to decisions and actions. PSO 4 - To pursue scientific research and develop new findings with global impact using latest technologies.	CO 1 - To analyze and evaluate functions of bounded variation and rectifiable curves. CO 2 - To describe the concept of Riemann-Stieltjes integral and its properties. CO 3 - To demonstrate the concept of step function, upper function, Lebesgue function and their integrals. CO 4 - To construct various mathematical proofs using the properties of Lebesgue integrals and establish the Levi monotone convergence theorem. CO 5 - To formulate the concept and properties of inner products, norms and measurable functions.

36	MP231CC3	Core Course III: Ordinary Differential Equations				☑	PO 1 - To apply their knowledge, analyze complex problems, think independently, formulate and perform quality research. PO 2 - To carry out internship programmes and research projects to develop scientific and innovative ideas through effective communication.	PSO 1 - To acquire good knowledge and understanding, to solve specific theoretical & applied problems in different area of mathematics & statistics. PSO 2 - To understand, formulate, develop mathematical arguments, logically and use quantitative models to address issues arising in social sciences, business and other context /fields.	CO 1 - To establish the qualitative behavior of solutions of systems of differential equations. CO 2 - To recognize the physical phenomena modeled by differential equations and dynamical systems. CO 3 - To analyze solutions using appropriate methods and give examples. CO 4 - To formulate Green's function for boundary value problems. CO 5 - To understand and use the various theoretical ideas and results that underlie the mathematics in course.
37	MP231EC1	Elective Course I: a) Number theory and Cryptography				☑	PO 1 - To apply their knowledge, analyze complex problems, think independently, formulate and perform quality research. PO 2 - To carry out internship programmes and research projects to develop scientific and innovative ideas through effective communication. PO 3 - To develop a multidisciplinary perspective and contribute to the knowledge capital of the globe. PO 5 - To through active career, team work and using managerial skills guide people to the right destination in a smooth and efficient way. PO 6 - To employ appropriate analysis tools and ICT in a range of learning scenarios, demonstrating the capacity to find, assess, and apply relevant information sources.	PSO 1 - To acquire good knowledge and understanding, to solve specific theoretical & applied problems in different area of mathematics & statistics. PSO 2 - To understand, formulate, develop mathematical arguments, logically and use quantitative models to address issues arising in social sciences, business and other context /fields. PSO 3 - To prepare the students who will demonstrate respectful engagement with other's ideas, behaviors, beliefs and apply diverse frames of references to decisions and actions.	CO 1 - To understand quadratic and power series forms and Jacobi symbol. CO 2 - To apply binary quadratic forms for the decomposition of a number into sum of sequences. CO 3 - To determine solutions using Arithmetic Functions. CO 4 - To calculate the possible partitions of a given number and draw Ferrer's graph. CO 5 - To identify the public key using Cryptography.
38	MP231EC2	Elective Course I: b) Graph Theory and Applications				☑	PO 1 - To apply their knowledge, analyze complex problems, think independently, formulate and perform quality research. PO 2 - To carry out internship programmes and research projects to develop scientific and innovative ideas through effective communication. PO 3 - To develop a multidisciplinary perspective and contribute to the knowledge capital of the globe. PO 4 - To develop innovative initiatives to sustain ecofriendly environment. PO 5 - To through active career, team work and using managerial skills guide people to the right destination in a smooth and efficient way. PO 6 - To employ appropriate analysis tools and ICT in a range of learning scenarios, demonstrating the capacity to find, assess, and apply relevant information sources. PO 7 - To learn independently for lifelong executing professional, social and ethical responsibilities leading to sustainable development.	PSO 1 - To acquire good knowledge and understanding, to solve specific theoretical & applied problems in different area of mathematics & statistics. PSO 2 - To understand, formulate, develop mathematical arguments, logically and use quantitative models to address issues arising in social sciences, business and other context /fields. PSO 3 - To prepare the students who will demonstrate respectful engagement with other's ideas, behaviors, beliefs and apply diverse frames of references to decisions and actions. PSO 4 - To pursue scientific research and develop new findings with global impact using latest technologies.	CO 1 - To recall the basic concepts of graph theory and know its various parameters. CO 2 - To understand the many results derived on the basis of known parameters. CO 3 - To apply the concepts to evaluate parameters for the family of graphs. CO 4 - To analyze the steps of various theorems and know its applications. CO 5 - To create a graphical model for the real-world problem using the relevant ideas.
39	MP231EC3	Elective Course I: c) Programming in C++				☑	PO 1 - To apply their knowledge, analyze complex problems, think independently, formulate and perform quality research. PO 2 - To carry out internship programmes and research projects to develop scientific and innovative ideas through effective communication. PO 3 - To develop a multidisciplinary perspective and contribute to the knowledge capital of the globe. PO 4 - To develop innovative initiatives to sustain ecofriendly environment. PO 5 - To through active career, team work and using managerial skills guide people to the right destination in a smooth and efficient way. PO 6 - To employ appropriate analysis tools and ICT in a range of learning scenarios, demonstrating the capacity to find, assess, and apply relevant information sources. PO 7 - To learn independently for lifelong executing professional, social and ethical responsibilities leading to sustainable development.	PSO 1 - To acquire good knowledge and understanding, to solve specific theoretical & applied problems in different area of mathematics & statistics. PSO 2 - To understand, formulate, develop mathematical arguments, logically and use quantitative models to address issues arising in social sciences, business and other context /fields. PSO 3 - To prepare the students who will demonstrate respectful engagement with other's ideas, behaviors, beliefs and apply diverse frames of references to decisions and actions. PSO 4 - To pursue scientific research and develop new findings with global impact using latest technologies. PSO 5 - To possess leadership, teamwork and professional skills, enabling them to become cultured and civilized individuals capable of effectively overcoming challenges in both private and public sectors.	CO 1 - To understand and analyze the concepts of tokens, expressions and control structures. CO 2 - To develop the knowledge in functions and arguments. CO 3 - To solve simple programs using classes and objects in C++. CO 4 - To apply the properties of constructors and destructors to solve programs. CO 5 - To create programs and applications using C++.

							PO	PSO	CO
40	MP231EC4	Elective Course II: a) Discrete Mathematics				☑	PO 1 - To apply their knowledge, analyze complex problems, think independently, formulate and perform quality research. PO 2 - To carry out internship programmes and research projects to develop scientific and innovative ideas through effective communication. PO 3 - To develop a multidisciplinary perspective and contribute to the knowledge capital of the globe. PO 4 - To develop innovative initiatives to sustain ecofriendly environment. PO 5 - To through active career, team work and using managerial skills guide people to the right destination in a smooth and efficient way. PO 7 - To learn independently for lifelong executing professional, social and ethical responsibilities leading to sustainable development.	PSO 1 - To acquire good knowledge and understanding, to solve specific theoretical & applied problems in different area of mathematics & statistics. PSO 2 - To understand, formulate, develop mathematical arguments, logically and use quantitative models to address issues arising in social sciences, business and other context /fields. PSO 4 - To pursue scientific research and develop new findings with global impact using latest technologies.	CO 1 - To remember and interpretthe basic concepts in permutations and combinations and distinguish between distribution of distinct and non-distinct objects. CO 2 - To interpret the recurrence relation and generating functions and evaluate by using the technique of generating functions. CO 3 - To solve the problems by the principle of inclusion and exclusion. CO 4 - To prove the basic theorems in Boolean Algebra and to develop the truth table for a Boolean expression. CO 5 - To differentiate between variety of lattices and their properties.
41	MP231EC5	Elective Course II: b) Analytic Number Theory				☑	PO 1 - To apply their knowledge, analyze complex problems, think independently, formulate and perform quality research. PO 2 - To carry out internship programmes and research projects to develop scientific and innovative ideas through effective communication. PO 3 - To develop a multidisciplinary perspective and contribute to the knowledge capital of the globe. PO 4 - To develop innovative initiatives to sustain ecofriendly environment. PO 5 - To through active career, team work and using managerial skills guide people to the right destination in a smooth and efficient way. PO 7 - To learn independently for lifelong executing professional, social and ethical responsibilities leading to sustainable development.	PSO 1 - To acquire good knowledge and understanding, to solve specific theoretical & applied problems in different area of mathematics & statistics. PSO 2 - To understand, formulate, develop mathematical arguments, logically and use quantitative models to address issues arising in social sciences, business and other context /fields. PSO 4 - To pursue scientific research and develop new findings with global impact using latest technologies. PSO 5 - To possess leadership, teamwork and professional skills, enabling them to become cultured and civilized individuals capable of effectively overcoming challenges in both private and public sectors.	CO 1 - To study the basic concepts of elementary number theory. CO 2 - To explain several arithmetical functions and construct their relationships. CO 3 - To apply algebraic structure in arithmetical functions. CO 4 - To demonstrate various identities satisfied by arithmetical functions. CO 5 - To determine the application to $\mu(n)$ & $\Lambda(n)$ and several equivalent form of prime number theorem.
42	MP231EC6	Elective Course II: c) Fuzzy Sets and their Applications				☑	PO 1 - To apply their knowledge, analyze complex problems, think independently, formulate and perform quality research. PO 2 - To carry out internship programmes and research projects to develop scientific and innovative ideas through effective communication. PO 3 - To develop a multidisciplinary perspective and contribute to the knowledge capital of the globe. PO 4 - To develop innovative initiatives to sustain ecofriendly environment. PO 5 - To through active career, team work and using managerial skills guide people to the right destination in a smooth and efficient way. PO 7 - To learn independently for lifelong executing professional, social and ethical responsibilities leading to sustainable development.	PSO 1 - To acquire good knowledge and understanding, to solve specific theoretical & applied problems in different area of mathematics & statistics. PSO 2 - To understand, formulate, develop mathematical arguments, logically and use quantitative models to address issues arising in social sciences, business and other context /fields. PSO 4 - To pursue scientific research and develop new findings with global impact using latest technologies. PSO 5 - To possess leadership, teamwork and professional skills, enabling them to become cultured and civilized individuals capable of effectively overcoming challenges in both private and public sectors.	CO 1 - To understand the definition of Fuzzy sets and its related concepts. CO 2 - To define Fuzzy Graphs and can explain the concepts. CO 3 - To explain the concepts in Fuzzy sets and its relations. CO 4 - To discuss about Fuzzy logic. CO 5 - To analyze the compositions of Fuzzy sets.
43	MP232CC1	Core Course IV: Advanced Algebra				☑	PO 1 - To apply their knowledge, analyze complex problems, think independently, formulate and perform quality research. PO 2 - To carry out internship programmes and research projects to develop scientific and innovative ideas through effective communication. PO 3 - To develop a multidisciplinary perspective and contribute to the knowledge capital of the globe. PO 5 - To through active career, team work and using managerial skills guide people to the right destination in a smooth and efficient way.	PSO 1 - To acquire good knowledge and understanding, to solve specific theoretical & applied problems in different area of mathematics & statistics. PSO 2 - To understand, formulate, develop mathematical arguments, logically and use quantitative models to address issues arising in social sciences, business and other context /fields.	CO 1 - To exhibit a foundational understanding of essential concepts, including field extensions, roots of polynomials, Galois Theory, and finite extensions. CO 2 - To demonstrate knowledge and understanding of the fundamental concepts including extension fields, Galois Theory, Automorphisms and Finite fields. CO 3 - To compose clear and accurate proofs using the concepts of Field extension, Galois Theory and Finite field. CO 4 - To examine the relationships between different types of field extensions and their implications by applying algebraic reasoning. CO 5 - To evaluate the validity of statements and theorems in field theory by providing proofs or counter examples.

44	MP232CC2	Core Course V: Real Analysis II				☑	PO 1 - To apply their knowledge, analyze complex problems, think independently, formulate and perform quality research. PO 2 - To carry out internship programmes and research projects to develop scientific and innovative ideas through effective communication. PO 3 - To develop a multidisciplinary perspective and contribute to the knowledge capital of the globe. PO 5 - To through active career, team work and using managerial skills guide people to the right destination in a smooth and efficient way.	PSO 1 - To acquire good knowledge and understanding, to solve specific theoretical & applied problems in different area of mathematics & statistics. PSO 2 - To understand, formulate, develop mathematical arguments, logically and use quantitative models to address issues arising in social sciences, business and other context /fields.	CO 1 - To recall and describe the basic concepts of measure, integration of functions, Fourier series on real line and multivariable differential calculus, implicit functions and extremism problems. CO 2 - To compare Boral measure with Lebesgue measure and the total derivatives with partial derivatives. CO 3 - To determine the matrix representation and Jacobian determinant of functions. CO 4 - To analyze the properties of measurable functions, Riemann and Lebesgue integrals, convergence of Fourier series and extrema of real valued functions. CO 5 - To test measurable sets and measurable functions.
45	MP232CC3	Core Course VI: Partial Differential Equations				☑	PO 1 - To apply their knowledge, analyze complex problems, think independently, formulate and perform quality research. PO 2 - To carry out internship programmes and research projects to develop scientific and innovative ideas through effective communication. PO 3 - To develop a multidisciplinary perspective and contribute to the knowledge capital of the globe. PO 5 - To through active career, team work and using managerial skills guide people to the right destination in a smooth and efficient way.	PSO 1 - To acquire good knowledge and understanding, to solve specific theoretical & applied problems in different area of mathematics & statistics. PSO 2 - To understand, formulate, develop mathematical arguments, logically and use quantitative models to address issues arising in social sciences, business and other context /fields.	CO 1 - To recall the definitions of complete integral, particular integral, and singular integrals. CO 2 - To learn some methods to solve the problems of non-linear first-order partial differential equations. homogeneous and non-homogeneous linear partial differential equations with constant coefficients and solve related problems. CO 3 - To analyze the classification of partial differential equations in three independent variables – Cauchy's problem for a second-order partial differential equation. CO 4 - To solve the boundary value problem for the heat equations and the wave equation. CO 5 - To apply the concepts and methods in physical processes like heat transfer and electrostatics.
46	MP232EC1	Elective Course III: a) Mathematical Statistics				☑	PO 1 - To apply their knowledge, analyze complex problems, think independently, formulate and perform quality research. PO 2 - To create innovative ideas to enhance entrepreneurial skills for economic independence. PO 3 - To reflect upon green initiatives and take responsible steps to build a sustainable environment. PO 5 - To communicate effectively and collaborate successfully with peers to become competent professionals.	PSO 1 - To acquire good knowledge and understanding, to solve specific theoretical & applied problems in different area of mathematics & statistics. PSO 2 - To understand, formulate, develop mathematical arguments, logically and use quantitative models to address issues arising in social sciences, business and other context /fields.	CO 1 - To recall the basic probability axioms, conditional probability, random variables and related concepts. CO 2 - To learn the transformation technique for finding the p.d.f of functions of random variables and use these techniques to solve related problems. CO 3 - To compute marginal and conditional distributions and check the stochastic independence. CO 4 - To employ the relevant concepts of analysis to determine limiting distributions of random variables. CO 5 - To design probability models to deal with real world problems andsolve problems involving probabilistic situations.
47	MP232EC2	Elective Course III: b) Statistical Data Analysis using R Programming				☑	PO 1 - To apply their knowledge, analyze complex problems, think independently, formulate and perform quality research. PO 2 - To create innovative ideas to enhance entrepreneurial skills for economic independence. PO 3 - To reflect upon green initiatives and take responsible steps to build a sustainable environment. PO 5 - To communicate effectively and collaborate successfully with peers to become competent professionals.	PSO 1 - To acquire good knowledge and understanding, to solve specific theoretical & applied problems in different area of mathematics & statistics. PSO 2 - To understand, formulate, develop mathematical arguments, logically and use quantitative models to address issues arising in social sciences, business and other context /fields.	CO 1 - To recall R and its development history. CO 2 - To demonstrate how to import and export data with R. CO 3 - To explain discrete distributions. CO 4 - To apply various concepts to write programs in R. CO 5 - To apply estimation concepts in R programming.
48	MP232EC3	Elective Course III: c) Programming in C++ Practical				☑	PO 1 - To apply their knowledge, analyze complex problems, think independently, formulate and perform quality research. PO 2 - To carry out internship programmes and research projects to develop scientific and innovative ideas through effective communication. PO 3 - To develop a multidisciplinary perspective and contribute to the knowledge capital of the globe. PO 5 - To through active career, team work and using managerial skills guide people to the right destination in a smooth and efficient way.	PSO 1 - To acquire good knowledge and understanding, to solve specific theoretical & applied problems in different area of mathematics & statistics. PSO 2 - To understand, formulate, develop mathematical arguments, logically and use quantitative models to address issues arising in social sciences, business and other context /fields.	CO 1 - To understand about object oriented programming and learn how to store one object inside another object. CO 2 - To gain knowledge about the capability to store information together in an object. CO 3 - To understand the capability of a class to rely upon another class. CO 4 - To analyze the process of exposing the essential data to the outside of the world and hiding the low level data. CO 5 - To understand about constructors which are special type of functions.
49	MP232EC4	Elective Course IV: a) Operations Modeling				☑	PO 1 - To apply their knowledge, analyze complex problems, think independently, formulate and perform quality research. PO 2 - To carry out internship programmes and research projects to develop scientific and innovative ideas through effective communication. PO 3 - To develop a multidisciplinary perspective and contribute to the knowledge capital of the globe. PO 5 - To through active career, team work and using managerial skills guide people to the right destination in a smooth and efficient way.	PSO 1 - To acquire good knowledge and understanding, to solve specific theoretical & applied problems in different area of mathematics & statistics. PSO 2 - To understand, formulate, develop mathematical arguments, logically and use quantitative models to address issues arising in social sciences, business and other context /fields.	CO 1 - To build and solve Transportation and Assignment problems using appropriate method. CO 2 - To learn the constructions of network and optimal scheduling using CPM and PERT. CO 3 - To ability to construct linear integer programming models and solve linear integer programming models using branch and bound method. CO 4 - To understand the need of inventory management. CO 5 - To understand basic characteristic features of a queuing system and acquire skills in analyzing queuing models.

No	Code	Course				✓	PO	PSO	CO
50	MP232EC5	Elective Course IV: b) Mathematical Python				☑	PO 1 - To apply their knowledge, analyze complex problems, think independently, formulate and perform quality research. PO 2 - To carry out internship programmes and research projects to develop scientific and innovative ideas through effective communication. PO 3 - To develop a multidisciplinary perspective and contribute to the knowledge capital of the globe. PO 5 - Through active career, team work and using managerial skills guide people to the right destination in a smooth and efficient way.	PSO 1 - To acquire good knowledge and understanding, to solve specific theoretical & applied problems in different area of mathematics & statistics. PSO 2 - To understand, formulate, develop mathematical arguments, logically and use quantitative models to address issues arising in social sciences, business and other context /fields. PSO 3 - To prepare the students who will demonstrate respectful engagement with other's ideas, behaviors, beliefs and apply diverse frames of references to decisions and actions.	CO 1 - To acquire knowledge on Python and learn to run the program. CO 2 - To understand and discuss about different data types and flow control statements. CO 3 - To write programs in python using Lists Tuples, Sets and Dictionaries. CO 4 - To understand For and While loops and conditional statements. CO 5 - To creates Functions and Arrays in Python.
51	MP232EC6	Elective Course IV: c) Neural Networks				☑	PO 1 - To apply their knowledge, analyze complex problems, think independently, formulate and perform quality research. PO 2 - To carry out internship programmes and research projects to develop scientific and innovative ideas through effective communication. PO 3 - To develop a multidisciplinary perspective and contribute to the knowledge capital of the globe. PO 5 - To through active career, team work and using managerial skills guide people to the right destination in a smooth and efficient way.	PSO 1 - To acquire good knowledge and understanding, to solve specific theoretical & applied problems in different area of mathematics & statistics. PSO 2 - To understand, formulate, develop mathematical arguments, logically and use quantitative models to address issues arising in social sciences, business and other context /fields.	CO 1 - To understand and analyze different neutron network models. CO 2 - To understand the basic ideas behind most common learning algorithms for multilayer perceptions, radial basis function networks. CO 3 - To describe Hebb rule and analyze back propagation algorithms with examples. CO 4 - To study convergence and generalization and implement common learning algorithms. CO 5 - To study directional derivatives and necessary conditions for optimality and to evaluate quadratic functions.
52	MP232SE1	Skill Enhancement I – Modeling and Simulation with Excel				☑	PO 1 - To apply their knowledge, analyze complex problems, think independently, formulate and perform quality research. PO 2 - To carry out internship programmes and research projects to develop scientific and innovative ideas through effective communication. PO 3 - To develop a multidisciplinary perspective and contribute to the knowledge capital of the globe. PO 5 - To through active career, team work and using managerial skills guide people to the right destination in a smooth and efficient way.	PSO 1 - To acquire good knowledge and understanding, to solve specific theoretical & applied problems in different area of mathematics & statistics. PSO 2 - To understand, formulate, develop mathematical arguments, logically and use quantitative models to address issues arising in social sciences, business and other context /fields. PSO 3 - To prepare the students who will demonstrate respectful engagement with other's ideas, behaviors, beliefs and apply diverse frames of references to decisions and actions.	CO 1 - To learn the spreadsheet and workbook. CO 2 - To understand the types of charts and graphs. CO 3 - To apply the custom data formats and layouts. CO 4 - To analyze the data with Excel. CO 5 - To create spreadsheets, workbooks and charts.
53	PM2031	Core IX: Field Theory and Lattices				☑	PO 1 - To prepare successful professionals in industry, government, academia, research, entrepreneurial pursuits and consulting firms. PO 2 - To face and succeed in high level competitive examinations like NET, GATE and TOFEL. PO 3 - To carry out internship programmes and research projects to develop scientific skills and innovative ideas. PO 4 - To utilize the obtained scientific knowledge to create eco-friendly environment.	PSO 1 - To utilize the knowledge gained for entrepreneurial pursuits. PSO 2 - To sharpen their analytical thinking, logical deductions and rigour in reasoning. PSO 3 - To use the techniques, skills and modern technology necessary to communicate effectively with professional and ethical responsibilities. PSO 4 - To understand the applications of mathematics in a global economic environmental and social context.	CO 1 - To recall the definitions and basic concepts of field theory and lattice theory. CO 2 - To express the fundamental concepts of field theory, Galois theory. CO 3 - To demonstrate the use of Galois theory to construct Galois group over the rationals. CO 4 - To distinguish between field theory and Galois theory. CO 5 - To interpret distributivity and modularity and apply these concepts in Boolean Algebra. CO 6 - To understand the theory of Frobenius Theorem. CO 7 - To develop the knowledge of lattices and establish new relationships in Boolean Algebra.
54	PM2032	Core X: Topology				☑	PO 1 - To prepare successful professionals in industry, government, academia, research, entrepreneurial pursuits and consulting firms. PO 2 - To face and succeed in high level competitive examinations like NET, GATE and TOFEL. PO 3 - To carry out internship programmes and research projects to develop scientific skills and innovative ideas. PO 4 - To utilize the obtained scientific knowledge to create eco-friendly environment.	PSO 1 - To utilize the knowledge gained for entrepreneurial pursuits. PSO 2 - To sharpen their analytical thinking, logical deductions and rigour in reasoning. PSO 3 - To use the techniques, skills and modern technology necessary to communicate effectively with professional and ethical responsibilities. PSO 4 - To understand the applications of mathematics in a global economic environmental and social context.	CO 1 - To understand the definitions of topological space, closed sets, limit points, continuity, connectedness, compactness, separation axioms and countability axioms. CO 2 - To construct a topology on a set so as to make it into a topological space. CO 3 - To distinguish the various topologies such as product and box topologies and topological spaces such as normal and regular spaces. CO 4 - To compare the concepts of components and path components, connectedness and local connectedness and countability axioms. CO 5 - To apply the various theorems related to regular space, normal space, Hausdorff space, compact space to other branches of mathematics. CO 6 - To construct continuous functions, homeomorphisms and projection mappings.
55	PM2033	Core XI: Measure Theory and Integration				☑	PO 1 - To prepare successful professionals in industry, government, academia, research, entrepreneurial pursuits and consulting firms. PO 2 - To face and succeed in high level competitive examinations like NET, GATE and TOFEL. PO 3 - To carry out internship programmes and research projects to develop scientific skills and innovative ideas. PO 4 - To utilize the obtained scientific knowledge to create eco-friendly environment.	PSO 1 - To utilize the knowledge gained for entrepreneurial pursuits. PSO 2 - To sharpen their analytical thinking, logical deductions and rigour in reasoning. PSO 3 - To use the techniques, skills and modern technology necessary to communicate effectively with professional and ethical responsibilities. PSO 4 - To understand the applications of mathematics in a global economic environmental and social context.	CO 1 - To define the concept of measures and Vitali covering and recall some properties of convergence of functions. CO 2 - To cite examples of measurable sets, measurable functions, Riemann integrals, Lebesgue integrals. CO 3 - To apply measures and Lebesgue integrals to various measurable sets and measurable functions. CO 4 - To apply outer measure, differentiation and integration to intervals, functions and sets. CO 5 - To compare the different types of measures and Signed measures. CO 6 - To construct Lp spaces and outer measurable sets.

56	PM2034	Elective III: a) Algebraic Number Theory and Cryptography				☑	PO 1 - To prepare successful professionals in industry, government, academia, research, entrepreneurial pursuits and consulting firms. PO 2 - To face and succeed in high level competitive examinations like NET, GATE and TOFEL. PO 3 - To carry out internship programmes and research projects to develop scientific skills and innovative ideas. PO 4 - To utilize the obtained scientific knowledge to create eco-friendly environment.	PSO 1 - To utilize the knowledge gained for entrepreneurial pursuits. PSO 2 - To sharpen their analytical thinking, logical deductions and rigour in reasoning. PSO 3 - To use the techniques, skills and modern technology necessary to communicate effectively with professional and ethical responsibilities. PSO 4 - To understand the applications of mathematics in a global economic environmental and social context.	CO 1 - To recall the basic results of field theory. CO 2 - To understand quadratic and power series forms and Jacobi symbol. CO 3 - To apply binary quadratic forms for the decomposition of a number into sum of sequences. CO 4 - To determine solutions using Arithmetic Functions. CO 5 - To calculate the possible partitions of a given number and draw Ferrer's graph. CO 6 - To identify the public key using Cryptography.
57	PM2035	Elective III: b) Stochastic Process				☑	PO 1 - To prepare successful professionals in industry, government, academia, research, entrepreneurial pursuits and consulting firms. PO 2 - To face and succeed in high level competitive examinations like NET, GATE and TOFEL. PO 3 - To carry out internship programmes and research projects to develop scientific skills and innovative ideas. PO 4 - To utilize the obtained scientific knowledge to create eco-friendly environment.	PSO 1 - To utilize the knowledge gained for entrepreneurial pursuits. PSO 2 - To sharpen their analytical thinking, logical deductions and rigour in reasoning. PSO 3 - To use the techniques, skills and modern technology necessary to communicate effectively with professional and ethical responsibilities. PSO 4 - To understand the applications of mathematics in a global economic environmental and social context.	CO 1 - To recall the concept of the theory of probability. CO 2 - To understand the definitions and specification of stochastic processes. CO 3 - To differentiate between different states of Markov system. CO 4 - To categorize different stochastic processes such as Poisson processes, Yule- Fury processes, birth and death processes. CO 5 - To calculate residual and current life times using renewal processes. CO 6 - To select the suitable queuing model in real life situations. CO 7 - To apply the theory to create the correct stochastic model for a given problem.
58	PM20PR	Major: Project	☑	☑	☑	☑	PO 1 - To prepare successful professionals in industry, government, academia, research, entrepreneurial pursuits and consulting firms. PO 2 - To face and succeed in high level competitive examinations like NET, GATE and TOFEL. PO 3 - To carry out internship programmes and research projects to develop scientific skills and innovative ideas. PO 4 - To utilize the obtained scientific knowledge to create eco-friendly environment.	PSO 1 - To utilize the knowledge gained for entrepreneurial pursuits. PSO 2 - To sharpen their analytical thinking, logical deductions and rigour in reasoning. PSO 3 - To use the techniques, skills and modern technology necessary to communicate effectively with professional and ethical responsibilities. PSO 4 - To understand the applications of mathematics in a global economic environmental and social context.	CO 1 - To choose a new topic of their interest. CO 2 - To develop the attitude of studying a topic in depth independently. CO 3 - To express their views with confidence in a group. CO 4 - To relate with the group members and reap the best harvest. CO 5 - To develop communication skills through oral presentation. CO 6 - To create a taste for research in mathematics. CO 7 - To develop confidence to face interviews. CO 8 - To interpret and analyze data mathematically.
59	PM20S1	Self Learning Course: Algebra for SET/CSIR-NET Exam		☑			PO 2 - To face and succeed in high level competitive examinations like NET, GATE and TOFEL. PO 3 - To carry out internship programmes and research projects to develop scientific skills and innovative ideas. PO 4 - To utilize the obtained scientific knowledge to create eco-friendly environment.	PSO 1 - To utilize the knowledge gained for entrepreneurial pursuits. PSO 2 - To sharpen their analytical thinking, logical deductions and rigour in reasoning. PSO 3 - To use the techniques, skills and modern technology necessary to communicate effectively with professional and ethical responsibilities. PSO 4 - To understand the applications of mathematics in a global economic environmental and social context.	CO 1 - To solve the problems based on vector spaces, subspaces and linear transformations. CO 2 - To understand the significant of linear independence, basis and dimensions. CO 3 - To recall matrix theory, linear equations and finding the rank and determine the determinant of matrices. CO 4 - To determine eigen values and eigen vectors and recall cayley-hamilton theorem. CO 5 - To acquire knowledge in solving problems by using matrix representation of linear transformations and change of basis. CO 6 - To differentiate various forms in matrices. CO 7 - To solve problems in inner product spaces, orthonormal basis and quadratic forms.
60	PM2041	Core XII: Complex Analysis				☑	PO 1 - To prepare successful professionals in industry, government, academia, research, entrepreneurial pursuits and consulting firms. PO 2 - To face and succeed in high level competitive examinations like NET, GATE and TOFEL. PO 3 - To carry out internship programmes and research projects to develop scientific skills and innovative ideas. PO 4 - To utilize the obtained scientific knowledge to create eco-friendly environment.	PSO 1 - To utilize the knowledge gained for entrepreneurial pursuits. PSO 2 - To sharpen their analytical thinking, logical deductions and rigour in reasoning. PSO 3 - To use the techniques, skills and modern technology necessary to communicate effectively with professional and ethical responsibilities. PSO 4 - To understand the applications of mathematics in a global economic environmental and social context.	CO 1 - To understand the fundamental concepts of complex variable theory. CO 2 - To effectively locate and use the information needed to prove theorems and establish mathematical results. CO 3 - To demonstrate the ability to integrate knowledge and ideas of complex differentiation and complex integration. CO 4 - To use appropriate techniques for solving related problems and for establishing theoretical results. CO 5 - To evaluate complicated real integrals through residue theorem. CO 6 - To know the theory of conformal mappings which has many physical applications and analyse its concepts.
61	PM2042	Core XIII: Functional Analysis				☑	PO 1 - To prepare successful professionals in industry, government, academia, research, entrepreneurial pursuits and consulting firms. PO 2 - To face and succeed in high level competitive examinations like NET, GATE and TOFEL. PO 4 - To utilize the obtained scientific knowledge to create eco-friendly environment.	PSO 1 - To utilize the knowledge gained for entrepreneurial pursuits. PSO 2 - To sharpen their analytical thinking, logical deductions and rigour in reasoning. PSO 4 - To understand the applications of mathematics in a global economic environmental and social context.	CO 1 - To learn and understand the definition of linear space, normed linear space, Banach Space and their examples. CO 2 - To explain the concept of different properties of Banach Spaces, Hahn Banach theorem. CO 3 - To compare different types of operators and their properties, Natural imbedding. CO 4 - To explain the ideas needed for open mapping theorem , Open Mapping theorem. CO 5 - To construct the idea of projections , the spectrum of an operator and develop problem solving skills , Matrices, Determinants. CO 6 - To learn and understand the definition of Hilbert Spaces ,Orthogonal Complements. CO 7 - To explain the concept of the adjoint of an operator, Normal and Unitary operators, Spectral Theory.

#	Code	Course				PO	PSO	CO
62	PM2043	Core XIV:Operations Research			☑	PO 1 - To prepare successful professionals in industry, government, academia, research, entrepreneurial pursuits and consulting firms. PO 2 - To face and succeed in high level competitive examinations like NET, GATE and TOFEL. PO 3 - To carry out internship programmes and research projects to develop scientific skills and innovative ideas.	PSO 1 - To utilize the knowledge gained for entrepreneurial pursuits. PSO 2 - To sharpen their analytical thinking, logical deductions and rigour in reasoning. PSO 3 - To use the techniques, skills and modern technology necessary to communicate effectively with professional and ethical responsibilities.	CO 1 - To explain the fundamental concept of DP model , Inventory model and Queuing model. CO 2 - To relate the concepts of Arrow (Network)diagram representations, in critical path calculations and construction of the Time chart. CO 3 - To distinguish deterministic model and single item. CO 4 - To interpret Poisson and Exponential distributions and apply these concepts in Queuing models. CO 5 - To solve life oriented decision making problems by optimizing the objective function.
63	PM2044	Core XV: Algorithmic Graph Theory			☑	PO 1 - To prepare successful professionals in industry, government, academia, research, entrepreneurial pursuits and consulting firms. PO 2 - To face and succeed in high level competitive examinations like NET, GATE and TOFEL. PO 3 - To carry out internship programmes and research projects to develop scientific skills and innovative ideas.	PSO 1 - To utilize the knowledge gained for entrepreneurial pursuits. PSO 2 - To sharpen their analytical thinking, logical deductions and rigour in reasoning. PSO 3 - To use the techniques, skills and modern technology necessary to communicate effectively with professional and ethical responsibilities.	CO 1 - To understand basic algorithms and write algorithms for simple computing. CO 2 - To analyse the efficiency of the algorithm. CO 3 - To understand and analyze algorithmic techniques to study basic parameters and properties of graphs. CO 4 - To use effectively techniques from graph theory, to solve practical problems in networking and communication.
64	PM2045	Elective IV : a) Combinatorics			☑	PO 1 - To prepare successful professionals in industry, government, academia, research, entrepreneurial pursuits and consulting firms. PO 2 - To face and succeed in high level competitive examinations like NET, GATE and TOFEL. PO 3 - To carry out internship programmes and research projects to develop scientific skills and innovative ideas. PO 4 - To utilize the obtained scientific knowledge to create eco-friendly environment.	PSO 1 - To utilize the knowledge gained for entrepreneurial pursuits. PSO 2 - To sharpen their analytical thinking, logical deductions and rigour in reasoning. PSO 3 - To use the techniques, skills and modern technology necessary to communicate effectively with professional and ethical responsibilities. PSO 4 - To understand the applications of mathematics in a global economic environmental and social context.	CO 1 - To discuss the basic concepts in permutation and combination, Recurrence Relations, Generating functions, The Principle of Inclusion and Exclusion. CO 2 - To distinguish between permutation and combination, distribution of distinct and non-distinct objects. CO 3 - To correlate recurrence relation and generating function. CO 4 - To solving problems by the technique of generating functions, combinations, recurrence relations, the principle of inclusion and exclusion. CO 5 - To interpret the principles of inclusion and exclusion, equivalence classes and functions. CO 6 - To develop the concepts of Polya's fundamental theorem and apply in Polya's theory of counting.
65	PM2046	Elective IV : b)Coding Theory			☑	PO 1 - To prepare successful professionals in industry, government, academia, research, entrepreneurial pursuits and consulting firms. PO 2 - To face and succeed in high level competitive examinations like NET, GATE and TOFEL. PO 3 - To carry out internship programmes and research projects to develop scientific skills and innovative ideas. PO 4 - To utilize the obtained scientific knowledge to create eco-friendly environment.	PSO 1 - To utilize the knowledge gained for entrepreneurial pursuits. PSO 2 - To sharpen their analytical thinking, logical deductions and rigour in reasoning. PSO 3 - To use the techniques, skills and modern technology necessary to communicate effectively with professional and ethical responsibilities. PSO 4 - To understand the applications of mathematics in a global economic environmental and social context.	CO 1 - To explain the fundamental concepts of coding theory. CO 2 - To analyze the fundamental problems of coding theory and the properties of specific codes. CO 3 - To translate the fundamental problems to mathematical problems. CO 4 - To construct codes by various methods for the chosen problem. CO 5 - To solve the problems by recalling the concepts of finite field, polynomial rings and finite groups. CO 6 - To apply coding theory in transmission of information in telecommunication (cell phones, data modems etc,.). CO 7 - To design simple cyclic codes with given properties.
66	PM20S2	Self Learning Course: Analysis for SET/CSIR-NET Exam	☑			PO 2 - To face and succeed in high level competitive examinations like NET, GATE and TOFEL. PO 3 - To carry out internship programmes and research projects to develop scientific skills and innovative ideas. PO 4 - To utilize the obtained scientific knowledge to create eco-friendly environment.	PSO 1 - To acquire good knowledge and understanding, to solve specific theoretical & applied problems in different area of mathematics & statistics. PSO 2 - To sharpen their analytical thinking, logical deductions and rigour in reasoning. PSO 3 - To use the techniques, skills and modern technology necessary to communicate effectively with professional and ethical responsibilities. PSO 4 - To understand the applications of mathematics in a global economic environmental and social context.	CO 1 - To recall the basic concepts of real number system, archimedian property, convergence and limit points. CO 2 - To acquire knowledge to solve problems based on compactness and connectedness. CO 3 - To understand the definitions and theorems on normed linear space and metric space. CO 4 - To evaluate simple concepts and solve problems related to continuity, uniform continuity and monotonic functions. CO 5 - To analyze the methods for solving problems in Riemann-integrals and improper integrals. CO 6 - To expand the sequences and series for the given problems. CO 7 - To compare convergence and uniform convergence and apply them in solving related problems.
		2022-2023						
67	MC2011	Major Core I: Differential Calculus and Trigonometry	☑			PO 1 - To equip students with hands on training through various courses to enhance entrepreneurship skills. PO 2 - To impart communicative skills and ethical values. PO 3 - To face challenging competitive examinations that offer rewarding careers in science and education. PO 4 - To apply the acquired scientific knowledge to face day to day needs and reflect upon green initiatives to build a sustainable environment.	PSO 1 - To acquire a strong foundation in various branches of mathematics to formulate real life problems into mathematical models. PSO 2 - To apply the mathematical knowledge and skills to develop problem solving skills cultivating logical thinking and face competitive examinations with confidence. PSO 3 - To develop entrepreneurial skills based on ethical values, become empowered and self-dependent in society. PSO 4 - To enhance numerical ability and address problems in interdisciplinary areas which would help in project and field works. PSO 5 - To pursue scientific research and develop new findings with global impact using latest technologies.	CO 1 - To recall the idea of derivative, rules of differentiation and understand the concept of p-r equation. CO 2 - To learn the concepts of curvature, circle of curvature, evolute and apply the concepts to solve problems. CO 3 - To recognize the rules of identifying asymptotes and employ the same to different curves. CO 4 - To acquire the knowledge about hyperbolic functions and compare it with circular functions, trigonometric functions, inverse trigonometric functions and their properties. CO 5 - To categorize the methods of finding the sum of trigonometric series.

#	Code	Course			PO	PSO	CO
68	MA2011	Allied I: Algebra and Calculus	☑		PO 1 - To equip students with hands on training through various courses to enhance entrepreneurship skills. PO 2 - To impart communicative skills and ethical values. PO 3 - To face challenging competitive examinations that offer rewarding careers in science and education. PO 4 - To apply the acquired scientific knowledge to face day to day needs and reflect upon green initiatives to build a sustainable environment.	PSO 1 - To acquire a strong foundation in various branches of mathematics to formulate real life problems into mathematical models. PSO 2 - To apply the mathematical knowledge and skills to develop problem solving skills cultivating logical thinking and face competitive examinations with confidence. PSO 3 - To develop entrepreneurial skills based on ethical values, become empowered and self-dependent in society. PSO 4 - To enhance numerical ability and address problems in interdisciplinary areas which would help in project and field works. PSO 5 - To pursue scientific research and develop new findings with global impact using latest technologies.	CO 1 - To recall the fundamentals of algebraic equations, matrices and rules of integration. CO 2 - To practice the formation of equations and compute symmetric functions of roots in terms of coefficients. CO 3 - To revise the properties of eigen values of the matrices. CO 4 - To learn Beta, Gamma functions and evaluate integrals using them. CO 5 - To practice the expansion of Fourier series and utilize the same for higher studies.
69	MNM201	Non Major Elective Course (NME): Quantitative Aptitude I		☑	PO 1 - To equip students with hands on training through various courses to enhance entrepreneurship skills. PO 3 - To face challenging competitive examinations that offer rewarding careers in science and education. PO 4 - To apply the acquired scientific knowledge to face day to day needs and reflect upon green initiatives to build a sustainable environment.	PSO 1 - To acquire a strong foundation in various branches of mathematics to formulate real life problems into mathematical models. PSO 2 - To apply the mathematical knowledge and skills to develop problem solving skills cultivating logical thinking and face competitive examinations with confidence. PSO 4 - To enhance numerical ability and address problems in interdisciplinary areas which would help in project and field works.	CO 1 - To apply BODMAS rule for simplification and determine missing numbers in a sequence. CO 2 - To express numbers in the base of a fraction of 100. CO 3 - To employ the problems related to the division of profit and loss of a business. CO 4 - To measure the relative magnitude of two quantities in an effective way. CO 5 - To construct and develop mathematical solutions to simple real life problems. CO 6 - To learn ratio and proportion and practice duplication and triplication of ratios.
70	MC2021	Major Core II: Classical Algebra and Integral Calculus	☑		PO 1 - To equip students with hands on training through various courses to enhance entrepreneurship skills. PO 2 - To impart communicative skills and ethical values. PO 3 - To face challenging competitive examinations that offer rewarding careers in science and education. PO 4 - To apply the acquired scientific knowledge to face day to day needs and reflect upon green initiatives to build a sustainable environment.	PSO 1 - To acquire a strong foundation in various branches of mathematics to formulate real life problems into mathematical models. PSO 2 - To apply the mathematical knowledge and skills to develop problem solving skills cultivating logical thinking and face competitive examinations with confidence. PSO 3 - To develop entrepreneurial skills based on ethical values, become empowered and self-dependent in society. PSO 4 - To enhance numerical ability and address problems in interdisciplinary areas which would help in project and field works. PSO 5 - To pursue scientific research and develop new findings with global impact using latest technologies.	CO 1 - To recall the fundamentals of algebraic equations and rules of integration. CO 2 - To apply fundamental theorem of algebra in framing and solving equations. CO 3 - To choose appropriate method for transformation of equations. CO 4 - To develop the skill of evaluation of double and triple integrals over different regions. CO 5 - To identify Beta, Gamma functions and utilize them for the evaluation of definite integrals. CO 6 - To develop the Fourier Series expansion in any interval and apply the same for solving technical and physical problems.
71	MA2021	Allied II: Vector Calculus and Differential Equations	☑		PO 1 - To equip students with hands on training through various courses to enhance entrepreneurship skills. PO 3 - To face challenging competitive examinations that offer rewarding careers in science and education. PO 4 - To apply the acquired scientific knowledge to face day to day needs and reflect upon green initiatives to build a sustainable environment.	PSO 1 - To acquire a strong foundation in various branches of mathematics to formulate real life problems into mathematical models. PSO 2 - To apply the mathematical knowledge and skills to develop problem solving skills cultivating logical thinking and face competitive examinations with confidence. PSO 4 - To enhance numerical ability and address problems in interdisciplinary areas which would help in project and field works. PSO 5 - To pursue scientific research and develop new findings with global impact using latest technologies.	CO 1 - To explain the physical meaning and properties of curl and divergence. CO 2 - To practice the computation of line integrals, surface integrals. CO 3 - To find the complementary function and particular integral of a differential equation by using appropriate methods. CO 4 - To use computational tools to solve problems and applications of partial differential equations of first order. CO 5 - To use Laplace transform and their inverse to solve differential equations.
72	MNM202	Non Major Elective Course (NME): Quantitative Aptitude II		☑	PO 1 - To equip students with hands on training through various courses to enhance entrepreneurship skills. PO 3 - To face challenging competitive examinations that offer rewarding careers in science and education. PO 4 - To apply the acquired scientific knowledge to face day to day needs and reflect upon green initiatives to build a sustainable environment.	PSO 1 - To acquire a strong foundation in various branches of mathematics to formulate real life problems into mathematical models. PSO 2 - To apply the mathematical knowledge and skills to develop problem solving skills cultivating logical thinking and face competitive examinations with confidence. PSO 4 - To enhance numerical ability and address problems in interdisciplinary areas which would help in project and field works.	CO 1 - To frame equations and solve problems involving ratios and fractions. CO 2 - To calculate the area and compare the objects on the basis of their size and area. CO 3 - To change the form of the number using logrithim and make tedious and confusing calculations simple. CO 4 - To have sufficient knowledge about the basis of calculation. CO 5 - To study the concept related to time, speed and distance.

73	MC2031	Major Core III: Differential Equations and Vector Calculus	☑				PO 1 - To equip students with hands on training through various courses to enhance entrepreneurship skills. PO 2 - To impart communicative skills and ethical values. PO 3 - To face challenging competitive examinations that offer rewarding careers in science and education. PO 4 - To apply the acquired scientific knowledge to face day to day needs and reflect upon green initiatives to build a sustainable environment.	PSO 1 - To acquire a strong foundation in various branches of mathematics to formulate real life problems into mathematical models. PSO 2 - To apply the mathematical knowledge and skills to develop problem solving skills cultivating logical thinking and face competitive examinations with confidence. PSO 3 - To develop entrepreneurial skills based on ethical values, become empowered and self-dependent in society. PSO 4 - To enhance numerical ability and address problems in interdisciplinary areas which would help in project and field works.	CO 1 - To distinguish linear, nonlinear, ordinary and partial differential equations. CO 2 - To solve linear differential equations with constant and variable coefficients. CO 3 - To explain the basic properties of Laplace Transforms and Inverse Laplace Transforms. CO 4 - To use the Laplace transform to find the solution of linear differential equations. CO 5 - To learn methods of forming and solving partial differential equations. CO 6 - To learn differentiation and integration of vector valued functions. CO 7 - To evaluate line and surface integrals using Green's theorem, Stoke's theorem and Gauss divergence theorem. CO 8 - To apply the concepts to solve problems in physical sciences and engineering.
74	MC2032	Major Core IV: Real Analysis I	☑				PO 1 - To equip students with hands on training through various courses to enhance entrepreneurship skills. PO 3 - To face challenging competitive examinations that offer rewarding careers in science and education. PO 4 - To apply the acquired scientific knowledge to face day to day needs and reflect upon green initiatives to build a sustainable environment.	PSO 1 - To acquire a strong foundation in various branches of mathematics to formulate real life problems into mathematical models. PSO 2 - To apply the mathematical knowledge and skills to develop problem solving skills cultivating logical thinking and face competitive examinations with confidence. PSO 4 - To enhance numerical ability and address problems in interdisciplinary areas which would help in project and field works. PSO 5 - To pursue scientific research and develop new findings with global impact using latest technologies.	CO 1 - To understand the basic concepts of real numbers. CO 2 - To explain and analyse the primary concepts of sequences and series of real numbers. CO 3 - To define convergence and divergence of sequences and series. CO 4 - To calculate the limit points, upper and lower limits of the sequences. CO 5 - To evaluate the convergence of series using different types of tests. CO 6 - To develop the skill of analyzing various sequence and series.
75	MA2031	Allied III: Probability Theory and Distributions	☑				PO 1 - To equip students with hands on training through various courses to enhance entrepreneurship skills. PO 2 - To impart communicative skills and ethical values. PO 3 - To face challenging competitive examinations that offer rewarding careers in science and education. PO 4 - To apply the acquired scientific knowledge to face day to day needs and reflect upon green initiatives to build a sustainable environment.	PSO 1 - To acquire a strong foundation in various branches of mathematics to formulate real life problems into mathematical models. PSO 2 - To apply the mathematical knowledge and skills to develop problem solving skills cultivating logical thinking and face competitive examinations with confidence. PSO 3 - To develop entrepreneurial skills based on ethical values, become empowered and self-dependent in society. PSO 4 - To enhance numerical ability and address problems in interdisciplinary areas which would help in project and field works. PSO 5 - To pursue scientific research and develop new findings with global impact using latest technologies.	CO 1 - To recall the definition of probability and set functions. CO 2 - To differentiate between probability and conditional probability and compute according to the requirement. CO 3 - To understand the definition of random variables, their types and related concepts. CO 4 - To detect the different probability distributions which are widely used. CO 5 - To apply the techniques to prove the properties of probability and related distributions. CO 6 - To choose the suitable probability distribution corresponding to a given data. CO 7 - To test the validity of a given data.
76	MS20S1	Self-Learning Course: Discrete Mathematics I	☑				PO 1 - To equip students with hands on training through various courses to enhance entrepreneurship skills. PO 2 - To impart communicative skills and ethical values. PO 3 - To face challenging competitive examinations that offer rewarding careers in science and education. PO 4 - To apply the acquired scientific knowledge to face day to day needs and reflect upon green initiatives to build a sustainable environment.	PSO 1 - To acquire a strong foundation in various branches of mathematics to formulate real life problems into mathematical models. PSO 2 - To apply the mathematical knowledge and skills to develop problem solving skills cultivating logical thinking and face competitive examinations with confidence. PSO 3 - To develop entrepreneurial skills based on ethical values, become empowered and self-dependent in society. PSO 4 - To enhance numerical ability and address problems in interdisciplinary areas which would help in project and field works.	CO 1 - To understand the basic principles of relations and its examples. CO 2 - To analyze various basic logical laws in Calculus and its properties. CO 3 - To develop the ability to solve problems in functions. CO 4 - To analyze real life problems using graph theory both quantitatively and qualitatively.
77	MC2041	Major Core V: Groups and Rings	☑				PO 1 - To equip students with hands on training through various courses to enhance entrepreneurship skills. PO 3 - To face challenging competitive examinations that offer rewarding careers in science and education. PO 4 - To apply the acquired scientific knowledge to face day to day needs and reflect upon green initiatives to build a sustainable environment.	PSO 1 - To acquire a strong foundation in various branches of mathematics to formulate real life problems into mathematical models. PSO 2 - To apply the mathematical knowledge and skills to develop problem solving skills cultivating logical thinking and face competitive examinations with confidence. PSO 4 - To enhance numerical ability and address problems in interdisciplinary areas which would help in project and field works. PSO 5 - To pursue scientific research and develop new findings with global impact using latest technologies.	CO 1 - To recall the definitions of groups ,rings, functions and also examples of groups and rings. CO 2 - To explain the properties of groups, rings and different types of groups and rings. CO 3 - To develop proofs of results on Permutation groups ,Cyclic groups, Quotient group, Subgroups, sub rings , quotient rings. CO 4 - To examine the properties of Ideals-Maximal and Prime ideals-Cosets-order of an element. CO 5 - To test the homomorphic and isomorphic properties of groups and rings. CO 6 - To develop the concepts of ordered integral domains and Unique Factorization Domains. CO 7 - To apply the theory of Groups and Rings and solve problems.

78	MC2042	Major Core VI: Analytical Geometry of 3 Dimensions	☑				PO 1 - To equip students with hands on training through various courses to enhance entrepreneurship skills. PO 2 - To impart communicative skills and ethical values. PO 3 - To face challenging competitive examinations that offer rewarding careers in science and education. PO 4 - To apply the acquired scientific knowledge to face day to day needs and reflect upon green initiatives to build a sustainable environment.	PSO 1 - To acquire a strong foundation in various branches of mathematics to formulate real life problems into mathematical models. PSO 2 - To apply the mathematical knowledge and skills to develop problem solving skills cultivating logical thinking and face competitive examinations with confidence. PSO 3 - To develop entrepreneurial skills based on ethical values, become empowered and self-dependent in society. PSO 4 - To enhance numerical ability and address problems in interdisciplinary areas which would help in project and field works. PSO 5 - To pursue scientific research and develop new findings with global impact using latest technologies.	CO 1 - To recall the basic definitions and concepts of planes and lines. CO 2 - To demonstrate the projection of the line joining two points, cosines of the line joining two points and will be able to solve problems. CO 3 - To calculate the distance between points, planes and the angles between lines and planes. CO 4 - To draw three dimensional surfaces from the given information. CO 5 - To discuss the characteristics and properties of 3-dimensional objects like sphere, cube, cone etc. CO 6 - To develop the skill in 3-dimensional geometry to gain mastery in related courses.
79	MA2041	Allied IV: Applied Statistics	☑				PO 1 - To equip students with hands on training through various courses to enhance entrepreneurship skills. PO 2 - To impart communicative skills and ethical values. PO 3 - To face challenging competitive examinations that offer rewarding careers in science and education. PO 4 - To apply the acquired scientific knowledge to face day to day needs and reflect upon green initiatives to build a sustainable environment.	PSO 1 - To acquire a strong foundation in various branches of mathematics to formulate real life problems into mathematical models. PSO 2 - To apply the mathematical knowledge and skills to develop problem solving skills cultivating logical thinking and face competitive examinations with confidence. PSO 3 - To develop entrepreneurial skills based on ethical values, become empowered and self-dependent in society. PSO 4 - To enhance numerical ability and address problems in interdisciplinary areas which would help in project and field works. PSO 5 - To pursue scientific research and develop new findings with global impact using latest technologies.	CO 1 - To identify and demonstrate appropriate sampling processes. CO 2 - To recall the methods of classifying and analyzing data relative to single variable. CO 3 - To describe the χ^2 distribution in statistics. CO 4 - To distinguish between the practical purposes of a large and a small sample. CO 5 - To understand that correlation coefficient is independent of the change of origin and scale.
80	MS20S2	Self-Learning Course: Discrete Mathematics II	☑				PO 1 - To equip students with hands on training through various courses to enhance entrepreneurship skills. PO 2 - To impart communicative skills and ethical values. PO 3 - To face challenging competitive examinations that offer rewarding careers in science and education. PO 4 - To apply the acquired scientific knowledge to face day to day needs and reflect upon green initiatives to build a sustainable environment.	PSO 1 - To acquire a strong foundation in various branches of mathematics to formulate real life problems into mathematical models. PSO 2 - To apply the mathematical knowledge and skills to develop problem solving skills cultivating logical thinking and face competitive examinations with confidence. PSO 3 - To develop entrepreneurial skills based on ethical values, become empowered and self-dependent in society. PSO 4 - To enhance numerical ability and address problems in interdisciplinary areas which would help in project and field works.	CO 1 - To know various types of lattices and analyze its properties. CO 2 - To understand the basic principles of Boolean Algebra. CO 3 - To interpret matrices and apply these concepts to find solutions of a system of linear equations. CO 4 - To use combinatorics for suitable applications.
81	MC2051	Major Core VII: Linear Algebra	☑				PO 1 - To equip students with hands on training through various courses to enhance entrepreneurship skills. PO 2 - To impart communicative skills and ethical values. PO 3 - To face challenging competitive examinations that offer rewarding careers in science and education. PO 4 - To apply the acquired scientific knowledge to face day to day needs and reflect upon green initiatives to build a sustainable environment.	PSO 1 - To acquire a strong foundation in various branches of mathematics to formulate real life problems into mathematical models. PSO 2 - To apply the mathematical knowledge and skills to develop problem solving skills cultivating logical thinking and face competitive examinations with confidence. PSO 3 - To develop entrepreneurial skills based on ethical values, become empowered and self-dependent in society.	CO 1 - To recall and define Groups, Fields and their properties. CO 2 - To cite examples of vector spaces ,subspaces and linear transformations. CO 3 - To determine the concepts of linear independence, linear dependence , basis and dimension of vector spaces. CO 4 - To correlate rank and nullity ,Linear transformation and matrix of a Linear transformation. CO 5 - To examine whether a given space is an inner product space and the orthonormality of sets.
82	MC2052	Major Core VIII: Real Analysis II	☑				PO 1 - To equip students with hands on training through various courses to enhance entrepreneurship skills. PO 2 - To impart communicative skills and ethical values. PO 3 - To face challenging competitive examinations that offer rewarding careers in science and education. PO 4 - To apply the acquired scientific knowledge to face day to day needs and reflect upon green initiatives to build a sustainable environment.	PSO 1 - To acquire a strong foundation in various branches of mathematics to formulate real life problems into mathematical models. PSO 2 - To apply the mathematical knowledge and skills to develop problem solving skills cultivating logical thinking and face competitive examinations with confidence. PSO 3 - To develop entrepreneurial skills based on ethical values, become empowered and self-dependent in society. PSO 4 - To enhance numerical ability and address problems in interdisciplinary areas which would help in project and field works. PSO 5 - To pursue scientific research and develop new findings with global impact using latest technologies.	CO 1 - To understand the concepts of completeness, continuity and discontinuity of metric spaces. CO 2 - To apply the metric space theorems to real life situations. CO 3 - To distinguish between continuous functions and uniform continuous functions. CO 4 - To use basic concepts in the development of real analysis results. CO 5 - To understand the concepts of metric space, connectedness and compactness of metric spaces. CO 6 - To develop the ability to reflect on problems that are quite significant in the field of analysis.

No.	Code	Course					PO	PSO	CO
83	MC2053	Major Core IX: Computer Oriented Numerical Methods				☑	PO 1 - To equip students with hands on training through various courses to enhance entrepreneurship skills. PO 2 - To impart communicative skills and ethical values. PO 3 - To face challenging competitive examinations that offer rewarding careers in science and education. PO 4 - To apply the acquired scientific knowledge to face day to day needs and reflect upon green initiatives to build a sustainable environment.	PSO 1 - To acquire a strong foundation in various branches of mathematics to formulate real life problems into mathematical models. PSO 2 - To apply the mathematical knowledge and skills to develop problem solving skills cultivating logical thinking and face competitive examinations with confidence. PSO 3 - To develop entrepreneurial skills based on ethical values, become empowered and self-dependent in society. PSO 4 - To enhance numerical ability and address problems in interdisciplinary areas which would help in project and field works. PSO 5 - To pursue scientific research and develop new findings with global impact using latest technologies.	CO 1 - To understand the elementary programming language and its structure. CO 2 - To develop computer programmes for the solution of various numerical problems. CO 3 - To apply numerical methods to obtain approximate solutions to mathematical problems. CO 4 - To employ different methods of constructing a polynomial using various methods. CO 5 - To compare the rate of convergence of different numerical formula. CO 6 - To distinguish the advantages and disadvantages of various numerical methods.
84	MC2054	Major: Project	☑	☑	☑	☑	PO 1 - To equip students with hands on training through various courses to enhance entrepreneurship skills. PO 2 - To impart communicative skills and ethical values. PO 4 - To apply the acquired scientific knowledge to face day to day needs and reflect upon green initiatives to build a sustainable environment.	PSO 1 - To acquire a strong foundation in various branches of mathematics to formulate real life problems into mathematical models. PSO 3 - To develop entrepreneurial skills based on ethical values, become empowered and self-dependent in society. PSO 4 - To enhance numerical ability and address problems in interdisciplinary areas which would help in project and field works. PSO 5 - To pursue scientific research and develop new findings with global impact using latest technologies.	CO 1 - To choose a new topic of their interest. CO 2 - To develop the attitude of studying a topic in depth independently. CO 3 - To express their views with confidence in a group. CO 4 - To relate with the group members and reap the best harvest. CO 5 - To develop communication skills through oral presentation. CO 6 - To create a taste for research in mathematics. CO 7 - To develop confidence to face interviews. CO 8 - To interpret and analyze data mathematically.
85	MC2055	Elective I: a) Graph Theory		☑			PO 1 - To equip students with hands on training through various courses to enhance entrepreneurship skills. PO 2 - To impart communicative skills and ethical values. PO 3 - To face challenging competitive examinations that offer rewarding careers in science and education. PO 4 - To apply the acquired scientific knowledge to face day to day needs and reflect upon green initiatives to build a sustainable environment.	PSO 1 - To acquire a strong foundation in various branches of mathematics to formulate real life problems into mathematical models. PSO 2 - To apply the mathematical knowledge and skills to develop problem solving skills cultivating logical thinking and face competitive examinations with confidence. PSO 3 - To develop entrepreneurial skills based on ethical values, become empowered and self-dependent in society. PSO 4 - To enhance numerical ability and address problems in interdisciplinary areas which would help in project and field works.	CO 1 - To understand the basic definitions to write the proofs of simple theorems. CO 2 - To employ the definitions to write the proofs of simple theorems. CO 3 - To relate real life situations with mathematical graphs. CO 4 - To develop the ability to solve problems in graph theory. CO 5 - To analyze real life problems using graph theory both quantitatively and qualitatively.
86	MC2056	Elective I: b) Fuzzy Mathematics		☑		☑	PO 1 - To equip students with hands on training through various courses to enhance entrepreneurship skills. PO 2 - To impart communicative skills and ethical values. PO 3 - To face challenging competitive examinations that offer rewarding careers in science and education. PO 4 - To apply the acquired scientific knowledge to face day to day needs and reflect upon green initiatives to build a sustainable environment.	PSO 1 - To acquire a strong foundation in various branches of mathematics to formulate real life problems into mathematical models. PSO 2 - To apply the mathematical knowledge and skills to develop problem solving skills cultivating logical thinking and face competitive examinations with confidence. PSO 3 - To develop entrepreneurial skills based on ethical values, become empowered and self-dependent in society. PSO 4 - To enhance numerical ability and address problems in interdisciplinary areas which would help in project and field works.	CO 1 - To understand the basic mathematical operations carried out on fuzzy sets. CO 2 - To compare fuzzy sets with crisp sets. CO 3 - To explain classical logic and fuzzy logic. CO 4 - To describe the significance of fuzzy systems and genetic algorithms. CO 5 - To solve problems that are appropriately solved by neural networks, fuzzy logic and genetic algorithms. CO 6 - To apply the concepts fuzzy systems and neural networks in various fields like machine intelligence and robotics. CO 7 - To differentiate between Possibility theory and Probability theory.
87	MC2057	Elective I: c) Object Oriented Programming with C++				☑	PO 1 - To equip students with hands on training through various courses to enhance entrepreneurship skills. PO 2 - To impart communicative skills and ethical values. PO 3 - To face challenging competitive examinations that offer rewarding careers in science and education. PO 4 - To apply the acquired scientific knowledge to face day to day needs and reflect upon green initiatives to build a sustainable environment.	PSO 1 - To acquire a strong foundation in various branches of mathematics to formulate real life problems into mathematical models. PSO 2 - To apply the mathematical knowledge and skills to develop problem solving skills cultivating logical thinking and face competitive examinations with confidence. PSO 3 - To develop entrepreneurial skills based on ethical values, become empowered and self-dependent in society. PSO 4 - To enhance numerical ability and address problems in interdisciplinary areas which would help in project and field works. PSO 5 - To pursue scientific research and develop new findings with global impact using latest technologies.	CO 1 - To apply C++ features to program design and implementation. CO 2 - To explain object oriented concepts and describe how they are supported by C++. CO 3 - To use C++ to demonstrate practical experience in developing object oriented solutions. CO 4 - To design and implement programs using C++. CO 5 - To analyze a problem description and design object oriented software using good coding practices and techniques. CO 6 - To implement an achievable practical applications and analyze issues related to object oriented techniques in the C++ programming language. CO 7 - To use common software patterns in object oriented design and recognize their applicability to other software development contexts. CO 8 - To create application using C++ programming language. CO 9 - To write algorithm for programs.

					PO	PSO	CO
88	MC2061	Major Core X: Complex Analysis	☑		PO 1 - To equip students with hands on training through various courses to enhance entrepreneurship skills. PO 2 - To impart communicative skills and ethical values. PO 4 - To apply the acquired scientific knowledge to face day to day needs and reflect upon green initiatives to build a sustainable environment.	PSO 1 - To acquire a strong foundation in various branches of mathematics to formulate real life problems into mathematical models. PSO 3 - To develop entrepreneurial skills based on ethical values, become empowered and self-dependent in society. PSO 4 - To enhance numerical ability and address problems in interdisciplinary areas which would help in project and field works. PSO 5 - To pursue scientific research and develop new findings with global impact using latest technologies.	CO 1 - To understand the geometric representation of mappings. CO 2 - To use differentiation rules to compute derivatives and express complex-differentiable functions as power series. CO 3 - To compute line integrals by using Cauchy's integral theorem and formula. CO 4 - To identify the isolated singularities of a function and determine whether they are removable, poles or essential. CO 5 - To evaluate definite integrals by using residues theorem.
89	MC2062	Major Core XI: Mechanics	☑		PO 1 - To equip students with hands on training through various courses to enhance entrepreneurship skills. PO 2 - To impart communicative skills and ethical values. PO 3 - To face challenging competitive examinations that offer rewarding careers in science and education. PO 4 - To apply the acquired scientific knowledge to face day to day needs and reflect upon green initiatives to build a sustainable environment.	PSO 1 - To acquire a strong foundation in various branches of mathematics to formulate real life problems into mathematical models. PSO 2 - To apply the mathematical knowledge and skills to develop problem solving skills cultivating logical thinking and face competitive examinations with confidence. PSO 3 - To develop entrepreneurial skills based on ethical values, become empowered and self-dependent in society. PSO 4 - To enhance numerical ability and address problems in interdisciplinary areas which would help in project and field works. PSO 5 - To pursue scientific research and develop new findings with global impact using latest technologies.	CO 1 - To calculate the reactions necessary to ensure static equilibrium. CO 2 - To apply the principles of static equilibrium to particles and rigid bodies. CO 3 - To understand the ways of distributing loads. CO 4 - To identify internal forces and moments of a rigid body. CO 5 - To apply the basic principles of projectiles into real world problems. CO 6 - To classify the laws of friction.
90	MC2063	Major Core XII: Number Theory	☑		PO 1 - To equip students with hands on training through various courses to enhance entrepreneurship skills. PO 2 - To impart communicative skills and ethical values. PO 3 - To face challenging competitive examinations that offer rewarding careers in science and education. PO 4 - To apply the acquired scientific knowledge to face day to day needs and reflect upon green initiatives to build a sustainable environment.	PSO 1 - To acquire a strong foundation in various branches of mathematics to formulate real life problems into mathematical models. PSO 2 - To apply the mathematical knowledge and skills to develop problem solving skills cultivating logical thinking and face competitive examinations with confidence. PSO 3 - To develop entrepreneurial skills based on ethical values, become empowered and self-dependent in society. PSO 4 - To enhance numerical ability and address problems in interdisciplinary areas which would help in project and field works. PSO 5 - To pursue scientific research and develop new findings with global impact using latest technologies.	CO 1 - To express the concepts and results of divisibility of integers effectively. CO 2 - To construct mathematical proofs of theorems and find counter examples for false statements. CO 3 - To collect and use numerical data to form conjectures about the integers. CO 4 - To understand the logic and methods behind the major proofs in Number Theory. CO 5 - To solve challenging problems related to Chinese remainder theorem effectively. CO 6 - To build up the basic theory of the integers from a list of axioms.
91	MC2064	Major Core XIII: Linear Programming	☑		PO 1 - To equip students with hands on training through various courses to enhance entrepreneurship skills. PO 2 - To impart communicative skills and ethical values. PO 4 - To apply the acquired scientific knowledge to face day to day needs and reflect upon green initiatives to build a sustainable environment.	PSO 1 - To acquire a strong foundation in various branches of mathematics to formulate real life problems into mathematical models. PSO 3 - To develop entrepreneurial skills based on ethical values, become empowered and self-dependent in society. PSO 4 - To enhance numerical ability and address problems in interdisciplinary areas which would help in project and field works.	CO 1 - To understand the methods of optimization and to solve the problems. CO 2 - To explain what is an LPP. CO 3 - To define how to formulate an LPP with linear constraints. CO 4 - To maximize the profit, minimize the cost, minimize the time in transportation problem, Travelling salesman problem, Assignment problem. CO 5 - To identify a problem in your locality, formulate it as an LPP and solve.
92	MC2065	Elective II: a) Astronomy		☑	PO 1 - To equip students with hands on training through various courses to enhance entrepreneurship skills. PO 3 - To face challenging competitive examinations that offer rewarding careers in science and education. PO 4 - To apply the acquired scientific knowledge to face day to day needs and reflect upon green initiatives to build a sustainable environment.	PSO 1 - To acquire a strong foundation in various branches of mathematics to formulate real life problems into mathematical models. PSO 2 - To apply the mathematical knowledge and skills to develop problem solving skills cultivating logical thinking and face competitive examinations with confidence. PSO 4 - To enhance numerical ability and address problems in interdisciplinary areas which would help in project and field works.	CO 1 - To define the spherical trigonometry of the celestial sphere. CO 2 - To discuss the Kepler's laws. CO 3 - To calculate the motion of two particles relative to the common mass centre. CO 4 - To interpret latitude and longitude and apply this to find the latitude and longitude of a particular place. CO 5 - To distinguish between Geometric Parallax and Horizontal Parallax.
93	MC2066	Elective II: b) Boolean Algebra		☑	PO 3 - To face challenging competitive examinations that offer rewarding careers in science and education. PO 4 - To apply the acquired scientific knowledge to face day to day needs and reflect upon green initiatives to build a sustainable environment.	PSO 1 - To acquire a strong foundation in various branches of mathematics to formulate real life problems into mathematical models. PSO 2 - To apply the mathematical knowledge and skills to develop problem solving skills cultivating logical thinking and face competitive examinations with confidence. PSO 5 - To pursue scientific research and develop new findings with global impact using latest technologies.	CO 1 - To discuss the primary concepts of Lattices and Boolean algebra. CO 2 - To recognize upper bound, lower bound, greatest lower bound. CO 3 - To differentiate between lattices and complete lattices. CO 4 - To relate the concepts of lattice homomorphism and isomorphism. CO 5 - To formulate problems in Lattices and Boolean Algebra.

No.	Code	Course				PO	PSO	CO
94	MC2067	Elective II: c) Web Designing with HTML	☑			PO 1 - To equip students with hands on training through various courses to enhance entrepreneurship skills. PO 3 - To face challenging competitive examinations that offer rewarding careers in science and education. PO 4 - To apply the acquired scientific knowledge to face day to day needs and reflect upon green initiatives to build a sustainable environment.	PSO 1 - To acquire a strong foundation in various branches of mathematics to formulate real life problems into mathematical models. PSO 2 - To apply the mathematical knowledge and skills to develop problem solving skills cultivating logical thinking and face competitive examinations with confidence. PSO 4 - To enhance numerical ability and address problems in interdisciplinary areas which would help in project and field works.	CO 1 - To define modern protocols and systems used on the web(such as HTML,HTTP). CO 2 - To employ fundamental knowledge on web designing with makeup language. CO 3 - To gain strong knowledge in HTML. CO 4 - To use critical thinking skills to design and implement an interactive websites with regard to issues of usability, accessibility and internationalism. CO 5 - To pursue future courses in website development and design.
95	MSK206	Skill Enhancement Course: Mathematics for Competitive Examinations		☑		PO 1 - To equip students with hands on training through various courses to enhance entrepreneurship skills. PO 3 - To face challenging competitive examinations that offer rewarding careers in science and education. PO 4 - To apply the acquired scientific knowledge to face day to day needs and reflect upon green initiatives to build a sustainable environment.	PSO 1 - To acquire a strong foundation in various branches of mathematics to formulate real life problems into mathematical models. PSO 2 - To apply the mathematical knowledge and skills to develop problem solving skills cultivating logical thinking and face competitive examinations with confidence. PSO 4 - To enhance numerical ability and address problems in interdisciplinary areas which would help in project and field works.	CO 1 - To recall the problems on ages. CO 2 - To discuss the problems on profit and loss. CO 3 - To conversion of ratio into proportion and vice versa. CO 4 - To analyze the problems related to chain rule. CO 5 - To evaluate time and work related problems.
96	PM2011	Core I: Algebra I			☑	PO 1 - To prepare successful professionals in industry, government, academia, research, entrepreneurial pursuits and consulting firms. PO 2 - To face and succeed in high level competitive examinations like NET, GATE and TOFEL. PO 3 - To carry out internship programmes and research projects to develop scientific skills and innovative ideas. PO 4 - To utilize the obtained scientific knowledge to create eco-friendly environment.	PSO 1 - To utilize the knowledge gained for entrepreneurial pursuits. PSO 2 - To sharpen their analytical thinking, logical deductions and rigour in reasoning. PSO 3 - To use the techniques, skills and modern technology necessary to communicate effectively with professional and ethical responsibilities. PSO 4 - To understand the applications of mathematics in a global economic environmental and social context.	CO 1 - To understand the fundamental concepts of abstract algebra and give illustrations. CO 2 - To analyze and demonstrate examples of various Sylow p- subgroups, automorphisms, conjugate classes, finite abelian groups, characteristic subgroups, rings, ideals, Euclidean domain, Factorization domain. CO 3 - To develop proofs for Sylow's theorems, finite abelian groups, direct products, Cauchy's theorem, Cayley's Theorem, automorphisms for groups. CO 4 - To develop the way of embedding of rings and design proofs for theorems related to rings, polynomial rings, Division Algorithm, Gauss' lemma and Eisenstein Criterion. CO 5 - To apply the concepts of Cayley's theorem, Counting principles, Sylow's theorems, Rings and Ideals in the structure of certain groups of small order. CO 6 - To compare Euclidean domain and Unique factorization domain, Polynomial Rings, Polynomial Rings over Commutative Rings and various concepts in Abstract Algebra.
97	PM2012	Core II: Analysis I			☑	PO 1 - To prepare successful professionals in industry, government, academia, research, entrepreneurial pursuits and consulting firms. PO 2 - To face and succeed in high level competitive examinations like NET, GATE and TOFEL. PO 3 - To carry out internship programmes and research projects to develop scientific skills and innovative ideas. PO 4 - To utilize the obtained scientific knowledge to create eco-friendly environment.	PSO 1 - To utilize the knowledge gained for entrepreneurial pursuits. PSO 2 - To sharpen their analytical thinking, logical deductions and rigour in reasoning. PSO 3 - To use the techniques, skills and modern technology necessary to communicate effectively with professional and ethical responsibilities. PSO 4 - To understand the applications of mathematics in a global economic environmental and social context.	CO 1 - To explain the fundamental concepts of analysis and their role in modern mathematics. CO 2 - To deal with various examples of metric space, compact sets and completeness in Euclidean space. CO 3 - To utilize the techniques for testing the convergence of sequence and series. CO 4 - To understand the important theorems such as Intermediate valued theorem, Mean value theorem, Roll's theorem, Taylor and L'Hospital theorem. CO 5 - To apply the concepts of differentiation in problems.
98	PM2013	Core III: Probability and Statistics			☑	PO 1 - To prepare successful professionals in industry, government, academia, research, entrepreneurial pursuits and consulting firms. PO 2 - To face and succeed in high level competitive examinations like NET, GATE and TOFEL. PO 3 - To carry out internship programmes and research projects to develop scientific skills and innovative ideas. PO 4 - To utilize the obtained scientific knowledge to create eco-friendly environment.	PSO 1 - To utilize the knowledge gained for entrepreneurial pursuits. PSO 2 - To sharpen their analytical thinking, logical deductions and rigour in reasoning. PSO 3 - To use the techniques, skills and modern technology necessary to communicate effectively with professional and ethical responsibilities. PSO 4 - To understand the applications of mathematics in a global economic environmental and social context.	CO 1 - To recall the basic probability axioms,conditional probability, random variables and related concepts. CO 2 - To compute marginal and conditional distributions and check the stochastic independence. CO 3 - To recall Binomial, Poisson and Normal distributions and learn new distributions such as multinomial, Chi square and Bivariate normal distributions. CO 4 - To learn the transformation technique for finding the p.d.f of functions of random variables and use these techniques to solve related problems. CO 5 - To employ the relevant concepts of analysis to determine limiting distributions of random variables. CO 6 - To learn Estimation, Point estimation and Confidence Intervals for Means, difference of means and variances. CO 7 - To design probability models to deal with real world problems and solve problems involving probabilistic situations.

99	PM2014	Core IV: Ordinary Differential Equations				☑	PO 1 - To prepare successful professionals in industry, government, academia, research, entrepreneurial pursuits and consulting firms. PO 2 - To face and succeed in high level competitive examinations like NET, GATE and TOFEL. PO 3 - To carry out internship programmes and research projects to develop scientific skills and innovative ideas. PO 4 - To utilize the obtained scientific knowledge to create eco-friendly environment.	PSO 1 - To utilize the knowledge gained for entrepreneurial pursuits. PSO 2 - To sharpen their analytical thinking, logical deductions and rigour in reasoning. PSO 3 - To use the techniques, skills and modern technology necessary to communicate effectively with professional and ethical responsibilities. PSO 4 - To understand the applications of mathematics in a global economic environmental and social context.	CO 1 - To recall the definitions of degree and order of differential equations and determine whether a system of functions is linearly independent using the Wronskian definition. CO 2 - To solve linear ordinary differential equations with constant coefficients by using power series expansion. CO 3 - To determine the solutions for a linear system of first order equations. CO 4 - To learn properties of Legendre polynomials and Properties of Bessel Functions. CO 5 - To analyze the concepts of existence and uniqueness of solutions of the ordinary differential equations. CO 6 - To create differential equations for a large number of real world problems.
100	PM2015	Elective I: a) Numerical Analysis				☑	PO 1 - To prepare successful professionals in industry, government, academia, research, entrepreneurial pursuits and consulting firms. PO 2 - To face and succeed in high level competitive examinations like NET, GATE and TOFEL. PO 3 - To carry out internship programmes and research projects to develop scientific skills and innovative ideas. PO 4 - To utilize the obtained scientific knowledge to create eco-friendly environment.	PSO 1 - To utilize the knowledge gained for entrepreneurial pursuits. PSO 2 - To sharpen their analytical thinking, logical deductions and rigour in reasoning. PSO 3 - To use the techniques, skills and modern technology necessary to communicate effectively with professional and ethical responsibilities. PSO 4 - To understand the applications of mathematics in a global economic environmental and social context.	CO 1 - To recall the methods of finding the roots of the algebraic and transcendental equations. CO 2 - To understand the significance of the finite, forward, backward and central differences and their properties. CO 3 - To learn the procedures of fitting straight lines and curves. CO 4 - To compute the solutions of a system of equations by using appropriate numerical methods. CO 5 - To solve the problems in ODE by using Taylor's series method, Euler's method etc.
101	PM2016	Elective I: b) Fuzzy Sets and Fuzzy Logic				☑	PO 1 - To prepare successful professionals in industry, government, academia, research, entrepreneurial pursuits and consulting firms. PO 2 - To face and succeed in high level competitive examinations like NET, GATE and TOFEL. PO 3 - To carry out internship programmes and research projects to develop scientific skills and innovative ideas. PO 4 - To utilize the obtained scientific knowledge to create eco-friendly environment.	PSO 1 - To utilize the knowledge gained for entrepreneurial pursuits. PSO 2 - To sharpen their analytical thinking, logical deductions and rigour in reasoning. PSO 3 - To use the techniques, skills and modern technology necessary to communicate effectively with professional and ethical responsibilities. PSO 4 - To understand the applications of mathematics in a global economic environmental and social context.	CO 1 - To define and explain the fundamental concepts of fuzzy set theory, including membership functions, fuzzy set operations (union, intersection, complement), and the extension principle. CO 2 - To identify and analyze real-world problems where fuzzy logic can be applied effectively. CO 3 - To design fuzzy logic systems for specific applications, such as fuzzy controllers for industrial processes or fuzzy decision-making systems. CO 4 - To understand the components of a fuzzy inference system and implementing rule-based fuzzy systems for various applications. CO 5 - To understand how to use fuzzy logic to control variables in dynamic systems, such as temperature control in HVAC systems or speed control in robotics. CO 6 - To be familiar with software tools and programming languages commonly used for implementing fuzzy logic systems, such as MATLAB. CO 7 - To use these tools to simulate and solve fuzzy logic problems.
102	PM2021	Core V: Modules and Vector Spaces				☑	PO 1 - To prepare successful professionals in industry, government, academia, research, entrepreneurial pursuits and consulting firms. PO 2 - To face and succeed in high level competitive examinations like NET, GATE and TOFEL. PO 3 - To carry out internship programmes and research projects to develop scientific skills and innovative ideas. PO 4 - To utilize the obtained scientific knowledge to create eco-friendly environment.	PSO 1 - To utilize the knowledge gained for entrepreneurial pursuits. PSO 2 - To sharpen their analytical thinking, logical deductions and rigour in reasoning. PSO 3 - To use the techniques, skills and modern technology necessary to communicate effectively with professional and ethical responsibilities. PSO 4 - To understand the applications of mathematics in a global economic environmental and social context.	CO 1 - To recall the definitions and properties of Vector Spaces and Subspaces. CO 2 - To analyze the concepts Linear Independence, Dependence and Basis. CO 3 - To apply the definition and properties of Linear transformation and Matrices of Linear transformation. CO 4 - To gain knowledge about characteristic polynomial, eigen vectors, eigen values and eigen spaces as well as the geometric and the algebraic multiplicities of an eigen value. CO 5 - To learn and apply Jordan form and triangular form for computations.
103	PM2022	Core VI: Analysis II				☑	PO 1 - To prepare successful professionals in industry, government, academia, research, entrepreneurial pursuits and consulting firms. PO 2 - To face and succeed in high level competitive examinations like NET, GATE and TOFEL. PO 3 - To carry out internship programmes and research projects to develop scientific skills and innovative ideas. PO 4 - To utilize the obtained scientific knowledge to create eco-friendly environment.	PSO 1 - To utilize the knowledge gained for entrepreneurial pursuits. PSO 2 - To sharpen their analytical thinking, logical deductions and rigour in reasoning. PSO 3 - To use the techniques, skills and modern technology necessary to communicate effectively with professional and ethical responsibilities. PSO 4 - To understand the applications of mathematics in a global economic environmental and social context.	CO 1 - To recall the definition of continuity, boundedness and some results on uniform convergence. CO 2 - To recognise the difference between pointwise and uniform convergence of a sequence of functions and Riemann Stieltjes integrals. CO 3 - To understand the close relation between equicontinuity and uniform convergence of sequence of continuous function and rectifiable curves. CO 4 - To learn Parseval's theorem, Stone Weierstrass theorem and know about its physical significance in terms of the power of the Fourier components. CO 5 - To utilize the definition of differentiation and partial derivative of function of several variables to solve problems. CO 6 - To interpret the concept of the contraction principle and the inverse function theorem.

104	PM2023	Core VII: Partial Differential Equations				☑	PO 1 - To prepare successful professionals in industry, government, academia, research, entrepreneurial pursuits and consulting firms. PO 2 - To face and succeed in high level competitive examinations like NET, GATE and TOFEL. PO 3 - To carry out internship programmes and research projects to develop scientific skills and innovative ideas. PO 4 - To utilize the obtained scientific knowledge to create eco-friendly environment.	PSO 1 - To utilize the knowledge gained for entrepreneurial pursuits. PSO 2 - To sharpen their analytical thinking, logical deductions and rigour in reasoning. PSO 3 - To use the techniques, skills and modern technology necessary to communicate effectively with professional and ethical responsibilities. PSO 4 - To understand the applications of mathematics in a global economic environmental and social context.	CO 1 - To recall the definitions of complete integral, particular integral and singular integrals. CO 2 - To learn some methods to solve the problems of non-linear first order partial differential equations. homogeneous and non homogeneous linear partial differential equations with constant coefficients and solve related problems. CO 3 - To analyze the classification of partial differential equations in three independent variables – cauchy's problem for a second order partial differential equations. CO 4 - To solve the boundary value problem for the heat equations and the wave equation. CO 5 - To apply the concepts and methods in physical processes like heat transfer and electrostatics.
105	PM2024	Core VIII: Graph Theory				☑	PO 1 - To prepare successful professionals in industry, government, academia, research, entrepreneurial pursuits and consulting firms. PO 2 - To face and succeed in high level competitive examinations like NET, GATE and TOFEL. PO 3 - To carry out internship programmes and research projects to develop scientific skills and innovative ideas. PO 4 - To utilize the obtained scientific knowledge to create eco-friendly environment.	PSO 1 - To utilize the knowledge gained for entrepreneurial pursuits. PSO 2 - To sharpen their analytical thinking, logical deductions and rigour in reasoning. PSO 3 - To use the techniques, skills and modern technology necessary to communicate effectively with professional and ethical responsibilities. PSO 4 - To understand the applications of mathematics in a global economic environmental and social context.	CO 1 - To identify cut vertices and understand various versions of connectedness of a graph. CO 2 - To understand the concept of Digraphs and characterize Eulerian Digraphs. CO 3 - To recall the definitions of Matchings and design proof for characterization of graphs containing a 1-factor. CO 4 - To solve problems involving coloring and learn necessary conditions for planar graphs. CO 5 - To learn the basic definitions of domination and review the concept of distance in a graph.
106	PM2025	Elective II: a) Classical Dynamics				☑	PO 1 - To prepare successful professionals in industry, government, academia, research, entrepreneurial pursuits and consulting firms. PO 2 - To face and succeed in high level competitive examinations like NET, GATE and TOFEL. PO 4 - To utilize the obtained scientific knowledge to create eco-friendly environment.	PSO 1 - To utilize the knowledge gained for entrepreneurial pursuits. PSO 2 - To sharpen their analytical thinking, logical deductions and rigour in reasoning. PSO 4 - To understand the applications of mathematics in a global economic environmental and social context.	CO 1 - To recall the concepts of Newton's laws of motion, momentum, acceleration, motion of a particle. CO 2 - To understand the generalized co-ordinates of the Mechanical system. CO 3 - To apply D'Alembert's Principle to solve the problems involving system of particles. CO 4 - To solve the Newton's equations for simple configuration using various methods. CO 5 - To transform the Lagrangian equations to Hamiltonian equations. CO 6 - To define the canonical transformations and Lagrange and Poisson brackets. CO 7 - To evaluate the system of particles by deriving the Jacobi equation and Jacobi's theorem. CO 8 - To understand the foundation of Hamilton's Principle and differential forms.
107	PM2026	Elective II: b)Differential Geometry				☑	PO 1 - To prepare successful professionals in industry, government, academia, research, entrepreneurial pursuits and consulting firms. PO 2 - To face and succeed in high level competitive examinations like NET, GATE and TOFEL. PO 3 - To carry out internship programmes and research projects to develop scientific skills and innovative ideas.	PSO 1 - To utilize the knowledge gained for entrepreneurial pursuits. PSO 2 - To sharpen their analytical thinking, logical deductions and rigour in reasoning. PSO 3 - To use the techniques, skills and modern technology necessary to communicate effectively with professional and ethical responsibilities.	CO 1 - To describe and analyze curves and surfaces in three-dimensional space, including their shapes, curvature, and parametric representations. CO 2 - To compute tangent vectors and normal curvature at any point on a curve or surface, enabling you to understand how objects bend and twist. CO 3 - To analyze and compute these important geometric concepts. CO 4 - To gain proficiency in Riemannian metrics, which are used to measure distances and angles on curved surfaces. CO 5 - To apply the principles of differential geometry to solve practical problems in fields such as computer graphics, robotics, and general relativity, enhancing your problem-solving skills.
108	PM2031	Core IX: Field Theory and Lattices				☑	PO 1 - To prepare successful professionals in industry, government, academia, research, entrepreneurial pursuits and consulting firms. PO 2 - To face and succeed in high level competitive examinations like NET, GATE and TOFEL. PO 3 - To carry out internship programmes and research projects to develop scientific skills and innovative ideas. PO 4 - To utilize the obtained scientific knowledge to create eco-friendly environment.	PSO 1 - To utilize the knowledge gained for entrepreneurial pursuits. PSO 2 - To sharpen their analytical thinking, logical deductions and rigour in reasoning. PSO 3 - To use the techniques, skills and modern technology necessary to communicate effectively with professional and ethical responsibilities. PSO 4 - To understand the applications of mathematics in a global economic environmental and social context.	CO 1 - To recall the definitions and basic concepts of field theory and lattice theory. CO 2 - To express the fundamental concepts of field theory, Galois theory. CO 3 - To demonstrate the use of Galois theory to construct Galois group over the rationals. CO 4 - To distinguish between field theory and Galois theory. CO 5 - To interpret distributivity and modularity and apply these concepts in Boolean Algebra. CO 6 - To understand the theory of Frobenius Theorem. CO 7 - To develop the knowledge of lattices and establish new relationships in Boolean Algebra.
109	PM2032	Core X: Topology				☑	PO 1 - To prepare successful professionals in industry, government, academia, research, entrepreneurial pursuits and consulting firms. PO 2 - To face and succeed in high level competitive examinations like NET, GATE and TOFEL. PO 3 - To carry out internship programmes and research projects to develop scientific skills and innovative ideas. PO 4 - To utilize the obtained scientific knowledge to create eco-friendly environment.	PSO 1 - To utilize the knowledge gained for entrepreneurial pursuits. PSO 2 - To sharpen their analytical thinking, logical deductions and rigour in reasoning. PSO 3 - To use the techniques, skills and modern technology necessary to communicate effectively with professional and ethical responsibilities. PSO 4 - To understand the applications of mathematics in a global economic environmental and social context.	CO 1 - To understand the definitions of topological space, closed sets, limit points, continuity, connectedness, compactness, separation axioms and countability axioms. CO 2 - To construct a topology on a set so as to make it into a topological space. CO 3 - To distinguish the various topologies such as product and box topologies and topological spaces such as normal and regular spaces. CO 4 - To compare the concepts of components and path components, connectedness and local connectedness and countability axioms. CO 5 - To apply the various theorems related to regular space, normal space, Hausdorff space, compact space to other branches of mathematics. CO 6 - To construct continuous functions, homeomorphisms and projection mappings.

#	Code	Course					PO	PSO	CO
110	PM2033	Core XI: Measure Theory and Integration				☑	PO 1 - To prepare successful professionals in industry, government, academia, research, entrepreneurial pursuits and consulting firms. PO 2 - To face and succeed in high level competitive examinations like NET, GATE and TOFEL. PO 3 - To carry out internship programmes and research projects to develop scientific skills and innovative ideas. PO 4 - To utilize the obtained scientific knowledge to create eco-friendly environment.	PSO 1 - To utilize the knowledge gained for entrepreneurial pursuits. PSO 2 - To sharpen their analytical thinking, logical deductions and rigour in reasoning. PSO 3 - To use the techniques, skills and modern technology necessary to communicate effectively with professional and ethical responsibilities. PSO 4 - To understand the applications of mathematics in a global economic environmental and social context.	CO 1 - To define the concept of measures and Vitali covering and recall some properties of convergence of functions. CO 2 - To cite examples of measurable sets , measurable functions, Riemann integrals, Lebesgue integrals. CO 3 - To apply measures and Lebesgue integrals to various measurable sets and measurable functions. CO 4 - To apply outer measure, differentiation and integration to intervals , functions and sets. CO 5 - To compare the different types of measures and Signed measures. CO 6 - To construct Lp spaces and outer measurable sets.
111	PM2034	Elective III: a) Algebraic Number Theory and Cryptography				☑	PO 1 - To prepare successful professionals in industry, government, academia, research, entrepreneurial pursuits and consulting firms. PO 2 - To face and succeed in high level competitive examinations like NET, GATE and TOFEL. PO 3 - To carry out internship programmes and research projects to develop scientific skills and innovative ideas. PO 4 - To utilize the obtained scientific knowledge to create eco-friendly environment.	PSO 1 - To utilize the knowledge gained for entrepreneurial pursuits. PSO 2 - To sharpen their analytical thinking, logical deductions and rigour in reasoning. PSO 3 - To use the techniques, skills and modern technology necessary to communicate effectively with professional and ethical responsibilities. PSO 4 - To understand the applications of mathematics in a global economic environmental and social context.	CO 1 - To recall the basic results of field theory. CO 2 - To understand quadratic and power series forms and Jacobi symbol. CO 3 - To apply binary quadratic forms for the decomposition of a number into sum of sequences. CO 4 - To determine solutions using Arithmetic Functions. CO 5 - To calculate the possible partitions of a given number and draw Ferrer's graph. CO 6 - To identify the public key using Cryptography.
112	PM2035	Elective III: b) Stochastic Process				☑	PO 1 - To prepare successful professionals in industry, government, academia, research, entrepreneurial pursuits and consulting firms. PO 2 - To face and succeed in high level competitive examinations like NET, GATE and TOFEL. PO 3 - To carry out internship programmes and research projects to develop scientific skills and innovative ideas. PO 4 - To utilize the obtained scientific knowledge to create eco-friendly environment.	PSO 1 - To utilize the knowledge gained for entrepreneurial pursuits. PSO 2 - To sharpen their analytical thinking, logical deductions and rigour in reasoning. PSO 3 - To use the techniques, skills and modern technology necessary to communicate effectively with professional and ethical responsibilities. PSO 4 - To understand the applications of mathematics in a global economic environmental and social context.	CO 1 - To recall the concept of the theory of probability. CO 2 - To understand the definitions and specification of stochastic processes. CO 3 - To differentiate between different states of Markov system. CO 4 - To categorize different stochastic processes such as Poisson processes, Yule- Fury processes, birth and death processes. CO 5 - To calculate residual and current life times using renewal processes. CO 6 - To select the suitable queuing model in real life situations. CO 7 - To apply the theory to create the correct stochastic model for a given problem.
113	PM20PR	Major: Project	☑	☑	☑	☑	PO 1 - To prepare successful professionals in industry, government, academia, research, entrepreneurial pursuits and consulting firms. PO 2 - To face and succeed in high level competitive examinations like NET, GATE and TOFEL. PO 3 - To carry out internship programmes and research projects to develop scientific skills and innovative ideas. PO 4 - To utilize the obtained scientific knowledge to create eco-friendly environment.	PSO 1 - To utilize the knowledge gained for entrepreneurial pursuits. PSO 2 - To sharpen their analytical thinking, logical deductions and rigour in reasoning. PSO 3 - To use the techniques, skills and modern technology necessary to communicate effectively with professional and ethical responsibilities. PSO 4 - To understand the applications of mathematics in a global economic environmental and social context.	CO 1 - To choose a new topic of their interest. CO 2 - To develop the attitude of studying a topic in depth independently. CO 3 - To express their views with confidence in a group. CO 4 - To relate with the group members and reap the best harvest. CO 5 - To develop communication skills through oral presentation. CO 6 - To create a taste for research in mathematics. CO 7 - To develop confidence to face interviews. CO 8 - To interpret and analyze data mathematically.
114	PM20S1	Self Learning Course: Algebra for SET/CSIR-NET Exam		☑			PO 2 - To face and succeed in high level competitive examinations like NET, GATE and TOFEL. PO 3 - To carry out internship programmes and research projects to develop scientific skills and innovative ideas. PO 4 - To utilize the obtained scientific knowledge to create eco-friendly environment.	PSO 1 - To utilize the knowledge gained for entrepreneurial pursuits. PSO 2 - To sharpen their analytical thinking, logical deductions and rigour in reasoning. PSO 3 - To use the techniques, skills and modern technology necessary to communicate effectively with professional and ethical responsibilities. PSO 4 - To understand the applications of mathematics in a global economic environmental and social context.	CO 1 - To solve the problems based on vector spaces, subspaces and linear transformations. CO 2 - To understand the significant of linear independence, basis and dimensions. CO 3 - To recall matrix theory, linear equations and finding the rank and determine the determinant of matrices. CO 4 - To determine eigen values and eigen vectors and recall cayley-hamilton theorem. CO 5 - To acquire knowledge in solving problems by using matrix representation of linear transformations and change of basis. CO 6 - To differentiate various forms in matrices. CO 7 - To solve problems in inner product spaces, orthonormal basis and quadratic forms.
115	PM2041	Core XII: Complex Analysis				☑	PO 1 - To prepare successful professionals in industry, government, academia, research, entrepreneurial pursuits and consulting firms. PO 2 - To face and succeed in high level competitive examinations like NET, GATE and TOFEL. PO 3 - To carry out internship programmes and research projects to develop scientific skills and innovative ideas. PO 4 - To utilize the obtained scientific knowledge to create eco-friendly environment.	PSO 1 - To utilize the knowledge gained for entrepreneurial pursuits. PSO 2 - To sharpen their analytical thinking, logical deductions and rigour in reasoning. PSO 3 - To use the techniques, skills and modern technology necessary to communicate effectively with professional and ethical responsibilities. PSO 4 - To understand the applications of mathematics in a global economic environmental and social context.	CO 1 - To understand the fundamental concepts of complex variable theory. CO 2 - To effectively locate and use the information needed to prove theorems and establish mathematical results. CO 3 - To demonstrate the ability to integrate knowledge and ideas of complex differentiation and complex integration. CO 4 - To use appropriate techniques for solving related problems and for establishing theoretical results. CO 5 - To evaluate complicated real integrals through residue theorem. CO 6 - To know the theory of conformal mappings which has many physical applications and analyse its concepts.

116	PM2042	Core XIII: Functional Analysis			☑	PO 1 - To prepare successful professionals in industry, government, academia, research, entrepreneurial pursuits and consulting firms. PO 2 - To face and succeed in high level competitive examinations like NET, GATE and TOFEL. PO 4 - To utilize the obtained scientific knowledge to create eco-friendly environment.	PSO 1 - To utilize the knowledge gained for entrepreneurial pursuits. PSO 2 - To sharpen their analytical thinking, logical deductions and rigour in reasoning. PSO 4 - To understand the applications of mathematics in a global economic environmental and social context.	CO 1 - To learn and understand the definition of linear space, normed linear space, Banach Space and their examples. CO 2 - To explain the concept of different properties of Banach Spaces, Hahn Banach theorem. CO 3 - To compare different types of operators and their properties, Natural imbedding. CO 4 - To explain the ideas needed for open mapping theorem , Open Mapping theorem. CO 5 - To construct the idea of projections , the spectrum of an operator and develop problem solving skills , Matrices, Determinants. CO 6 - To learn and understand the definition of Hilbert Spaces ,Orthogonal Complements. CO 7 - To explain the concept of the adjoint of an operator, Normal and Unitary operators, Spectral Theory.
117	PM2043	Core XIV: Operations Research			☑	PO 1 - To prepare successful professionals in industry, government, academia, research, entrepreneurial pursuits and consulting firms. PO 2 - To face and succeed in high level competitive examinations like NET, GATE and TOFEL. PO 3 - To carry out internship programmes and research projects to develop scientific skills and innovative ideas.	PSO 1 - To utilize the knowledge gained for entrepreneurial pursuits. PSO 2 - To sharpen their analytical thinking, logical deductions and rigour in reasoning. PSO 3 - To use the techniques, skills and modern technology necessary to communicate effectively with professional and ethical responsibilities.	CO 1 - To explain the fundamental concept of DP model , Inventory model and Queuing model. CO 2 - To relate the concepts of Arrow (Network)diagram representations, in critical path calculations and construction of the Time chart. CO 3 - To distinguish deterministic model and single item. CO 4 - To interpret Poisson and Exponential distributions and apply these concepts in Queuing models. CO 5 - To solve life oriented decision making problems by optimizing the objective function.
118	PM2044	Core XV: Algorithmic Graph Theory			☑	PO 1 - To prepare successful professionals in industry, government, academia, research, entrepreneurial pursuits and consulting firms. PO 2 - To face and succeed in high level competitive examinations like NET, GATE and TOFEL. PO 3 - To carry out internship programmes and research projects to develop scientific skills and innovative ideas.	PSO 1 - To utilize the knowledge gained for entrepreneurial pursuits. PSO 2 - To sharpen their analytical thinking, logical deductions and rigour in reasoning. PSO 3 - To use the techniques, skills and modern technology necessary to communicate effectively with professional and ethical responsibilities.	CO 1 - To understand basic algorithms and write algorithms for simple computing. CO 2 - To analyse the efficiency of the algorithm. CO 3 - To understand and analyze algorithmic techniques to study basic parameters and properties of graphs. CO 4 - To use effectively techniques from graph theory, to solve practical problems in networking and communication.
119	PM2045	Elective IV : a) Combinatorics			☑	PO 1 - To prepare successful professionals in industry, government, academia, research, entrepreneurial pursuits and consulting firms. PO 2 - To face and succeed in high level competitive examinations like NET, GATE and TOFEL. PO 3 - To carry out internship programmes and research projects to develop scientific skills and innovative ideas. PO 4 - To utilize the obtained scientific knowledge to create eco-friendly environment.	PSO 1 - To utilize the knowledge gained for entrepreneurial pursuits. PSO 2 - To sharpen their analytical thinking, logical deductions and rigour in reasoning. PSO 3 - To use the techniques, skills and modern technology necessary to communicate effectively with professional and ethical responsibilities. PSO 4 - To understand the applications of mathematics in a global economic environmental and social context.	CO 1 - To discuss the basic concepts in permutation and combination, Recurrence Relations, Generating functions, The Principle of Inclusion and Exclusion. CO 2 - To distinguish between permutation and combination, distribution of distinct and non-distinct objects. CO 3 - To correlate recurrence relation and generating function. CO 4 - To solving problems by the technique of generating functions, combinations, recurrence relations, the principle of inclusion and exclusion. CO 5 - To interpret the principles of inclusion and exclusion, equivalence classes and functions. CO 6 - To develop the concepts of Polya's fundamental theorem and apply in Polya's theory of counting .
120	PM2046	Elective IV : b)Coding Theory			☑	PO 1 - To prepare successful professionals in industry, government, academia, research, entrepreneurial pursuits and consulting firms. PO 2 - To face and succeed in high level competitive examinations like NET, GATE and TOFEL. PO 3 - To carry out internship programmes and research projects to develop scientific skills and innovative ideas. PO 4 - To utilize the obtained scientific knowledge to create eco-friendly environment.	PSO 1 - To utilize the knowledge gained for entrepreneurial pursuits. PSO 2 - To sharpen their analytical thinking, logical deductions and rigour in reasoning. PSO 3 - To use the techniques, skills and modern technology necessary to communicate effectively with professional and ethical responsibilities. PSO 4 - To understand the applications of mathematics in a global economic environmental and social context.	CO 1 - To explain the fundamental concepts of coding theory. CO 2 - To analyze the fundamental problems of coding theory and the properties of specific codes. CO 3 - To translate the fundamental problems to mathematical problems. CO 4 - To construct codes by various methods for the chosen problem. CO 5 - To solve the problems by recalling the concepts of finite field, polynomial rings and finite groups. CO 6 - To apply coding theory in transmission of information in telecommunication (cell phones, data modems etc,.). CO 7 - To design simple cyclic codes with given properties.
121	PM20S2	Self Learning Course: Analysis for SET/CSIR-NET Exam	☑			PO 2 - To face and succeed in high level competitive examinations like NET, GATE and TOFEL. PO 3 - To carry out internship programmes and research projects to develop scientific skills and innovative ideas. PO 4 - To utilize the obtained scientific knowledge to create eco-friendly environment.	PSO 1 - To utilize the knowledge gained for entrepreneurial pursuits. PSO 2 - To sharpen their analytical thinking, logical deductions and rigour in reasoning. PSO 3 - To use the techniques, skills and modern technology necessary to communicate effectively with professional and ethical responsibilities. PSO 4 - To understand the applications of mathematics in a global economic environmental and social context.	CO 1 - To recall the basic concepts of real number system, archimedian property, convergence and limit points. CO 2 - To acquire knowledge to solve problems based on compactness and connectedness. CO 3 - To understand the definitions and theorems on normed linear space and metric space. CO 4 - To evaluate simple concepts and solve problems related to continuity, uniform continuity and monotonic functions. CO 5 - To analyze the methods for solving problems in Riemann-integrals and improper integrals. CO 6 - To expand the sequences and series for the given problems. CO 7 - To compare convergence and uniform convergence and apply them in solving related problems.
		2021-2022						

#	Code	Title					PO	PSO	CO
122	MC2011	Major Core I: Differential Calculus and Trigonometry		☑			PO 1 - To equip students with hands on training through various courses to enhance entrepreneurship skills. PO 2 - To impart communicative skills and ethical values. PO 3 - To face challenging competitive examinations that offer rewarding careers in science and education. PO 4 - To apply the acquired scientific knowledge to face day to day needs and reflect upon green initiatives to build a sustainable environment.	PSO 1 - To acquire a strong foundation in various branches of mathematics to formulate real life problems into mathematical models. PSO 2 - To apply the mathematical knowledge and skills to develop problem solving skills cultivating logical thinking and face competitive examinations with confidence. PSO 3 - To develop entrepreneurial skills based on ethical values, become empowered and self-dependent in society. PSO 4 - To enhance numerical ability and address problems in interdisciplinary areas which would help in project and field works. PSO 5 - To pursue scientific research and develop new findings with global impact using latest technologies.	CO 1 - To recall the idea of derivative, rules of differentiation and understand the concept of p-r equation. CO 2 - To learn the concepts of curvature, circle of curvature, evolute and apply the concepts to solve problems. CO 3 - To recognize the rules of identifying asymptotes and employ the same to different curves. CO 4 - To acquire the knowledge about hyperbolic functions and compare it with circular functions, trigonometric functions, inverse trigonometric functions and their properties. CO 5 - To categorize the methods of finding the sum of trigonometric series.
123	MA2011	Allied I: Algebra and Calculus		☑			PO 1 - To equip students with hands on training through various courses to enhance entrepreneurship skills. PO 2 - To impart communicative skills and ethical values. PO 3 - To face challenging competitive examinations that offer rewarding careers in science and education PO 4 - To apply the acquired scientific knowledge to face day to day needs and reflect upon green initiatives to build a sustainable environment.	PSO 1 - To acquire a strong foundation in various branches of mathematics to formulate real life problems into mathematical models. PSO 2 - To apply the mathematical knowledge and skills to develop problem solving skills cultivating logical thinking and face competitive examinations with confidence. PSO 3 - To develop entrepreneurial skills based on ethical values, become empowered and self-dependent in society. PSO 4 - To enhance numerical ability and address problems in interdisciplinary areas which would help in project and field works.	CO 1 - To recall the fundamentals of algebraic equations, matrices and rules of integration. CO 2 - To practice the formation of equations and compute symmetric functions of roots in terms of coefficients. CO 3 - To revise the properties of eigen values of the matrices. CO 4 - To learn Beta, Gamma functions and evaluate integrals using them. CO 5 - To practice the expansion of Fourier series and utilize the same for higher studies.
124	MNM201	Non Major Elective Course (NME): Quantitative Aptitude I			☑		PO 1 - To equip students with hands on training through various courses to enhance entrepreneurship skills. PO 3 - To face challenging competitive examinations that offer rewarding careers in science and education. PO 4 - To apply the acquired scientific knowledge to face day to day needs and reflect upon green initiatives to build a sustainable environment.	PSO 1 - To acquire a strong foundation in various branches of mathematics to formulate real life problems into mathematical models. PSO 2 - To apply the mathematical knowledge and skills to develop problem solving skills cultivating logical thinking and face competitive examinations with confidence. PSO 4 - To enhance numerical ability and address problems in interdisciplinary areas which would help in project and field works.	CO 1 - To apply BODMAS rule for simplification and determine missing numbers in a sequence. CO 2 - To express numbers in the base of a fraction of 100. CO 3 - To employ the problems related to the division of profit and loss of a business. CO 4 - To measure the relative magnitude of two quantities in an effective way. CO 5 - To construct and develop mathematical solutions to simple real life problems. CO 6 - To learn ratio and proportion and practice duplication and triplication of ratios.
125	MC2021	Major Core II: Classical Algebra and Integral Calculus		☑			PO 1 - To equip students with hands on training through various courses to enhance entrepreneurship skills. PO 2 - To impart communicative skills and ethical values. PO 3 - To face challenging competitive examinations that offer rewarding careers in science and education. PO 4 - To apply the acquired scientific knowledge to face day to day needs and reflect upon green initiatives to build a sustainable environment.	PSO 1 - To acquire a strong foundation in various branches of mathematics to formulate real life problems into mathematical models. PSO 2 - To apply the mathematical knowledge and skills to develop problem solving skills cultivating logical thinking and face competitive examinations with confidence. PSO 3 - To develop entrepreneurial skills based on ethical values, become empowered and self-dependent in society. PSO 4 - To enhance numerical ability and address problems in interdisciplinary areas which would help in project and field works. PSO 5 - To pursue scientific research and develop new findings with global impact using latest technologies.	CO 1 - To recall the fundamentals of algebraic equations and rules of integration. CO 2 - To apply fundamental theorem of algebra in framing and solving equations. CO 3 - To choose appropriate method for transformation of equations. CO 4 - To develop the skill of evaluation of double and triple integrals over different regions. CO 5 - To identify Beta, Gamma functions and utilize them for the evaluation of definite integrals. CO 6 - To develop the Fourier Series expansion in any interval and apply the same for solving technical and physical problems.
126	MA2021	Allied II: Vector Calculus and Differential Equations		☑			PO 1 - To equip students with hands on training through various courses to enhance entrepreneurship skills. PO 3 - To face challenging competitive examinations that offer rewarding careers in science and education. PO 4 - To apply the acquired scientific knowledge to face day to day needs and reflect upon green initiatives to build a sustainable environment.	PSO 1 - To acquire a strong foundation in various branches of mathematics to formulate real life problems into mathematical models. PSO 2 - To apply the mathematical knowledge and skills to develop problem solving skills cultivating logical thinking and face competitive examinations with confidence. PSO 4 - To enhance numerical ability and address problems in interdisciplinary areas which would help in project and field works. PSO 5 - To pursue scientific research and develop new findings with global impact using latest technologies.	CO 1 - To explain the physical meaning and properties of curl and divergence. CO 2 - To practice the computation of line integrals, surface integrals. CO 3 - To find the complementary function and particular integral of a differential equation by using appropriate methods. CO 4 - To use computational tools to solve problems and applications of partial differential equations of first order. CO 5 - To use Laplace transform and their inverse to solve differential equations.
127	MNM202	Non Major Elective Course (NME): Quantitative Aptitude II			☑		PO 1 - To equip students with hands on training through various courses to enhance entrepreneurship skills. PO 3 - To face challenging competitive examinations that offer rewarding careers in science and education. PO 4 - To apply the acquired scientific knowledge to face day to day needs and reflect upon green initiatives to build a sustainable environment.	PSO 1 - To acquire a strong foundation in various branches of mathematics to formulate real life problems into mathematical models. PSO 2 - To apply the mathematical knowledge and skills to develop problem solving skills cultivating logical thinking and face competitive examinations with confidence. PSO 4 - To enhance numerical ability and address problems in interdisciplinary areas which would help in project and field works.	CO 1 - To frame equations and solve problems involving ratios and fractions. CO 2 - To calculate the area and compare the objects on the basis of their size and area. CO 3 - To change the form of the number using lograthim and make tedious and confusing calculations simple. CO 4 - To have sufficient knowledge about the basis of calculation. CO 5 - To study the concept related to time, speed and distance.

#	Code	Course	☑			PO	PSO	CO
128	MC2031	Major Core III: Differential Equations and Vector Calculus	☑			PO 1 - To equip students with hands on training through various courses to enhance entrepreneurship skills. PO 2 - To impart communicative skills and ethical values. PO 3 - To face challenging competitive examinations that offer rewarding careers in science and education. PO 4 - To apply the acquired scientific knowledge to face day to day needs and reflect upon green initiatives to build a sustainable environment.	PSO 1 - To acquire a strong foundation in various branches of mathematics to formulate real life problems into mathematical models. PSO 2 - To apply the mathematical knowledge and skills to develop problem solving skills cultivating logical thinking and face competitive examinations with confidence. PSO 3 - To develop entrepreneurial skills based on ethical values, become empowered and self-dependent in society. PSO 4 - To enhance numerical ability and address problems in interdisciplinary areas which would help in project and field works.	CO 1 - To distinguish linear, nonlinear, ordinary and partial differential equations. CO 2 - To solve linear differential equations with constant and variable coefficients. CO 3 - To explain the basic properties of Laplace Transforms and Inverse Laplace Transforms. CO 4 - To use the Laplace transform to find the solution of linear differential equations. CO 5 - To learn methods of forming and solving partial differential equations. CO 6 - To learn differentiation and integration of vector valued functions. CO 7 - To evaluate line and surface integrals using Green's theorem, Stoke's theorem and Gauss divergence theorem. CO 8 - To apply the concepts to solve problems in physical sciences and engineering.
129	MC2032	Major Core IV: Real Analysis I	☑			PO 1 - To equip students with hands on training through various courses to enhance entrepreneurship skills. PO 3 - To face challenging competitive examinations that offer rewarding careers in science and education. PO 4 - To apply the acquired scientific knowledge to face day to day needs and reflect upon green initiatives to build a sustainable environment.	PSO 1 - To acquire a strong foundation in various branches of mathematics to formulate real life problems into mathematical models. PSO 2 - To apply the mathematical knowledge and skills to develop problem solving skills cultivating logical thinking and face competitive examinations with confidence. PSO 4 - To enhance numerical ability and address problems in interdisciplinary areas which would help in project and field works. PSO 5 - To pursue scientific research and develop new findings with global impact using latest technologies.	CO 1 - To understand the basic concepts of real numbers. CO 2 - To explain and analyse the primary concepts of sequences and series of real numbers. CO 3 - To define convergence and divergence of sequences and series. CO 4 - To calculate the limit points, upper and lower limits of the sequences. CO 5 - To evaluate the convergence of series using different types of tests. CO 6 - To develop the skill of analyzing various sequence and series.
130	MA2031	Allied III: Probability Theory and Distributions	☑			PO 1 - To equip students with hands on training through various courses to enhance entrepreneurship skills. PO 2 - To impart communicative skills and ethical values. PO 3 - To face challenging competitive examinations that offer rewarding careers in science and education. PO 4 - To apply the acquired scientific knowledge to face day to day needs and reflect upon green initiatives to build a sustainable environment.	PSO 1 - To acquire a strong foundation in various branches of mathematics to formulate real life problems into mathematical models. PSO 2 - To apply the mathematical knowledge and skills to develop problem solving skills cultivating logical thinking and face competitive examinations with confidence. PSO 3 - To develop entrepreneurial skills based on ethical values, become empowered and self-dependent in society. PSO 4 - To enhance numerical ability and address problems in interdisciplinary areas which would help in project and field works. PSO 5 - To pursue scientific research and develop new findings with global impact using latest technologies.	CO 1 - To recall the definition of probability and set functions. CO 2 - To differentiate between probability and conditional probability and compute according to the requirement. CO 3 - To understand the definition of random variables, their types and related concepts. CO 4 - To detect the different probability distributions which are widely used. CO 5 - To apply the techniques to prove the properties of probability and related distributions. CO 6 - To choose the suitable probability distribution corresponding to a given data. CO 7 - To test the validity of a given data.
131	MS20S1	Self-Learning Course: Discrete Mathematics I	☑			PO 1 - To equip students with hands on training through various courses to enhance entrepreneurship skills. PO 2 - To impart communicative skills and ethical values. PO 3 - To face challenging competitive examinations that offer rewarding careers in science and education. PO 4 - To apply the acquired scientific knowledge to face day to day needs and reflect upon green initiatives to build a sustainable environment.	PSO 1 - To acquire a strong foundation in various branches of mathematics to formulate real life problems into mathematical models. PSO 2 - To apply the mathematical knowledge and skills to develop problem solving skills cultivating logical thinking and face competitive examinations with confidence. PSO 3 - To develop entrepreneurial skills based on ethical values, become empowered and self-dependent in society. PSO 4 - To enhance numerical ability and address problems in interdisciplinary areas which would help in project and field works.	CO 1 - To understand the basic principles of relations and its examples. CO 2 - To analyze various basic logical laws in Calculus and its properties. CO 3 - To develop the ability to solve problems in functions. CO 4 - To analyze real life problems using graph theory both quantitatively and qualitatively.
132	MC2041	Major Core V: Groups and Rings	☑			PO 1 - To equip students with hands on training through various courses to enhance entrepreneurship skills. PO 3 - To face challenging competitive examinations that offer rewarding careers in science and education. PO 4 - To apply the acquired scientific knowledge to face day to day needs and reflect upon green initiatives to build a sustainable environment.	PSO 1 - To acquire a strong foundation in various branches of mathematics to formulate real life problems into mathematical models. PSO 2 - To apply the mathematical knowledge and skills to develop problem solving skills cultivating logical thinking and face competitive examinations with confidence. PSO 4 - To enhance numerical ability and address problems in interdisciplinary areas which would help in project and field works. PSO 5 - To pursue scientific research and develop new findings with global impact using latest technologies.	CO 1 - To recall the definitions of groups ,rings, functions and also examples of groups and rings. CO 2 - To explain the properties of groups, rings and different types of groups and rings. CO 3 - To develop proofs of results on Permutation groups ,Cyclic groups, Quotient group, Subgroups, sub rings , quotient rings. CO 4 - To examine the properties of Ideals-Maximal and Prime ideals-Cosets-order of an element. CO 5 - To test the homomorphic and isomorphic properties of groups and rings. CO 6 - To develop the concepts of ordered integral domains and Unique Factorization Domains. CO 7 - To apply the theory of Groups and Rings and solve problems.

133	MC2042	Major Core VI: Analytical Geometry of 3 Dimensions	☑			PO 1 - To equip students with hands on training through various courses to enhance entrepreneurship skills. PO 2 - To impart communicative skills and ethical values. PO 3 - To face challenging competitive examinations that offer rewarding careers in science and education. PO 4 - To apply the acquired scientific knowledge to face day to day needs and reflect upon green initiatives to build a sustainable environment.	PSO 1 - To acquire a strong foundation in various branches of mathematics to formulate real life problems into mathematical models. PSO 2 - To apply the mathematical knowledge and skills to develop problem solving skills cultivating logical thinking and face competitive examinations with confidence. PSO 3 - To develop entrepreneurial skills based on ethical values, become empowered and self-dependent in society. PSO 4 - To enhance numerical ability and address problems in interdisciplinary areas which would help in project and field works. PSO 5 - To pursue scientific research and develop new findings with global impact using latest technologies.	CO 1 - To recall the basic definitions and concepts of planes and lines. CO 2 - To demonstrate the projection of the line joining two points, cosines of the line joining two points and will be able to solve problems. CO 3 - To calculate the distance between points, planes and the angles between lines and planes. CO 4 - To draw three dimensional surfaces from the given information. CO 5 - To discuss the characteristics and properties of 3 - dimensional objects like sphere, cube, cone etc. CO 6 - To develop the skill in 3 - dimensional geometry to gain mastery in related courses.
134	MA2041	Allied IV: Applied Statistics	☑			PO 1 - To equip students with hands on training through various courses to enhance entrepreneurship skills. PO 2 - To impart communicative skills and ethical values. PO 3 - To face challenging competitive examinations that offer rewarding careers in science and education. PO 4 - To apply the acquired scientific knowledge to face day to day needs and reflect upon green initiatives to build a sustainable environment.	PSO 1 - To acquire a strong foundation in various branches of mathematics to formulate real life problems into mathematical models. PSO 2 - To apply the mathematical knowledge and skills to develop problem solving skills cultivating logical thinking and face competitive examinations with confidence. PSO 3 - To develop entrepreneurial skills based on ethical values, become empowered and self-dependent in society. PSO 4 - To enhance numerical ability and address problems in interdisciplinary areas which would help in project and field works. PSO 5 - To pursue scientific research and develop new findings with global impact using latest technologies.	CO 1 - To identify and demonstrate appropriate sampling processes. CO 2 - To recall the methods of classifying and analyzing data relative to single variable. CO 3 - To describe the χ^2 distribution in statistics. CO 4 - To distinguish between the practical purposes of a large and a small sample. CO 5 - To understand that correlation coefficient is independent of the change of origin and scale.
135	MS20S2	Self-Learning Course: Discrete Mathematics II	☑			PO 1 - To equip students with hands on training through various courses to enhance entrepreneurship skills. PO 2 - To impart communicative skills and ethical values. PO 3 - To face challenging competitive examinations that offer rewarding careers in science and education. PO 4 - To apply the acquired scientific knowledge to face day to day needs and reflect upon green initiatives to build a sustainable environment.	PSO 1 - To acquire a strong foundation in various branches of mathematics to formulate real life problems into mathematical models. PSO 2 - To apply the mathematical knowledge and skills to develop problem solving skills cultivating logical thinking and face competitive examinations with confidence. PSO 3 - To develop entrepreneurial skills based on ethical values, become empowered and self-dependent in society. PSO 4 - To enhance numerical ability and address problems in interdisciplinary areas which would help in project and field works.	CO 1 - To know various types of lattices and analyze its properties. CO 2 - To understand the basic principles of Boolean Algebra. CO 3 - To interpret matrices and apply these concepts to find solutions of a system of linear equations. CO 4 - To use combinatorics for suitable applications.
136	MC1751	Major Core VII: Linear Algebra	☑			PO 1 - To apply the acquired scientific knowledge to face day to day needs. PO 3 - To carry out field works and projects independently and in collaboration with other institutions and industries. PO 5 - To face challenging competitive examinations that offer rewarding careers in science and education.	PSO 1 - To acquire a strong foundation in various branches of mathematics to formulate real life problems into mathematical models. PSO 2 - To develop problem solving skills, cultivating logical thinking, and face competitive examinations with confidence. PSO 3 - To enhance numerical ability and address problems in interdisciplinary areas which would help in project and field works.	CO 1 - To recall and define Groups ,Fields and their properties. CO 2 - To cite examples of vector spaces ,subspaces and linear transformations. CO 3 - To determine the concepts of linear independence, linear dependence , basis and dimension of vector spaces. CO 4 - To correlate rank and nullity ,Linear transformation and matrix of a Linear transformation. CO 5 - To examine whether a given space is an inner product space and the orthonormality of sets.
137	MC1752	Major Core VIII: Real Analysis	☑			PO 1 - To apply the acquired scientific knowledge to face day to day needs. PO 3 - To carry out field works and projects independently and in collaboration with other institutions and industries. PO 4 - To reflect upon green initiatives and take responsible steps to build a sustainable environment. PO 5 - To face challenging competitive examinations that offer rewarding careers in science and education. PO 6 - To impart communicative skills and ethical values.	PSO 1 - To acquire a strong foundation in various branches of mathematics to formulate real life problems into mathematical models. PSO 4 - To apply the mathematical knowledge and skills to face competitive examination with confidence. PSO 7 - To understand the professional, ethical, legal, security, social issues and responsibilities. PSO 8 - To apply knowledge of principles, concepts and results in specific subject area to analyze their local and global impact. PSO 9- To communicate appropriately and effectively, in a scientific context using present technology and new findings.	CO 1 - To understand the concepts of completeness, continuity and discontinuity of metric spaces. CO 2 - To apply the metric space theorems to real life situations. CO 3 - To distinguish between continuous functions and uniform continuous functions. CO 4 - To use basic concepts in the development of real analysis results. CO 5 - To understand the concepts of countable sets, metric space, connectedness, compactness of metric spaces. CO 6 - To develop the ability to reflect on problems that are quite significant in the field of real analysis.
138	MC1753	Major Core IX: Graph Theory	☑			PO 1 - To apply the acquired scientific knowledge to face day to day needs. PO 3 - To carry out field works and projects independently and in collaboration with other institutions and industries. PO 5 - To face challenging competitive examinations that offer rewarding careers in science and education.	PSO 1 - To acquire a strong foundation in various branches of mathematics to formulate real life problems into mathematical models. PSO 2 - To develop problem solving skills, cultivating logical thinking, and face competitive examinations with confidence. PSO 3 - To enhance numerical ability and address problems in interdisciplinary areas which would help in project and field works. PSO 4 - To apply the mathematical knowledge and skills to face competitive examination with confidence.	CO 1 - To understand the basic definitions to write the proofs of simple theorems. CO 2 - To employ the definitions to write the proofs of simple theorems. CO 3 - To relate real life situations with mathematical graphs. CO 4 - To develop the ability to solve problems in graph theory. CO 5 - To analyze real life problems using graph theory both quantitatively and qualitatively.

#	Code	Course	C1	C2	C3	C4	PO	PSO	CO
139	MC1754	Major: Project	☑	☑	☑	☑	PO 1 - To apply the acquired scientific knowledge to face day to day needs. PO 3 - To carry out field works and projects independently and in collaboration with other institutions and industries. PO 5 - To face challenging competitive examinations that offer rewarding careers in science and education.	PSO 1 - To acquire a strong foundation in various branches of mathematics to formulate real life problems into mathematical models. PSO 3 - To enhance numerical ability and address problems in interdisciplinary areas which would help in project and field works. PSO 4 - To apply the mathematical knowledge and skills to face competitive examination with confidence. PSO 5 - To pursue higher studies which in turn will offer them job opportunities in government and public sector undertakings, banks, central government institutes etc.	CO 1 - To choose a new topic of their interest. CO 2 - To develop the attitude of studying a topic in depth independently. CO 3 - To express their views with confidence in a group. CO 4 - To relate with the group members and reap the best harvest. CO 5 - To develop communication skills through oral presentation. CO 6 - To create a taste for research in mathematics. CO 7 - To develop confidence to face interviews. CO 8 - To interpret and analyze data mathematically.
140	MC1755	Elective I: a) Numerical Methods		☑			PO 1 - To apply the acquired scientific knowledge to face day to day needs. PO 3 - To carry out field works and projects independently and in collaboration with other institutions and industries. PO 5 - To face challenging competitive examinations that offer rewarding careers in science and education.	PSO 1 - To acquire a strong foundation in various branches of mathematics to formulate real life problems into mathematical models. PSO 2 - To develop problem solving skills, cultivating logical thinking, and face competitive examinations with confidence. PSO 3 - To enhance numerical ability and address problems in interdisciplinary areas which would help in project and field works. PSO 4 - To apply the mathematical knowledge and skills to face competitive examination with confidence.	CO 1 - To understand the basic definitions and meaning of interpolation. CO 2 - To select appropriate numerical methods and apply the same to various types of problems. CO 3 - To apply numerical methods to obtain approximate solutions to mathematical problems. CO 4 - To employ different methods of constructing a polynomial using various methods. CO 5 - To compare the rate of convergence of different numerical formula. CO 6 - To distinguish the advantages and disadvantages of various numerical methods.
141	MC1756	Elective I: b) Fuzzy Mathematics		☑		☑	PO 1 - To apply the acquired scientific knowledge to face day to day needs. PO 3 - To carry out field works and projects independently and in collaboration with other institutions and industries. PO 5 - To face challenging competitive examinations that offer rewarding careers in science and education.	PSO 1 - To acquire a strong foundation in various branches of mathematics to formulate real life problems into mathematical models. PSO 2 - To develop problem solving skills, cultivating logical thinking, and face competitive examinations with confidence. PSO 3 - To enhance numerical ability and address problems in interdisciplinary areas which would help in project and field works. PSO 4 - To apply the mathematical knowledge and skills to face competitive examination with confidence.	CO 1 - To understand the basic mathematical operations carried out on fuzzy sets. CO 2 - To compare fuzzy sets with crisp sets. CO 3 - To explain classical logic and fuzzy logic. CO 4 - To describe the significance of fuzzy systems and genetic algorithms. CO 5 - To solve problems that are appropriately solved by neural networks , fuzzy logic and genetic algorithms. CO 6 - To apply the concepts fuzzy systems and neural networks in various fields like machine intelligence and robotics. CO 7 - To differentiate between Possibility theory and Probability theory.
142	MC1757	Elective I: c) Object Oriented Programming with C++				☑	PO 1 - To apply the acquired scientific knowledge to face day to day needs. PO 3 - To carry out field works and projects independently and in collaboration with other institutions and industries. PO 5 - To face challenging competitive examinations that offer rewarding careers in science and education.	PSO 1 - To acquire a strong foundation in various branches of mathematics to formulate real life problems into mathematical models. PSO 2 - To develop problem solving skills, cultivating logical thinking, and face competitive examinations with confidence. PSO 3 - To enhance numerical ability and address problems in interdisciplinary areas which would help in project and field works. PSO 4 - To apply the mathematical knowledge and skills to face competitive examination with confidence. PSO 5 - To pursue higher studies which in turn will offer them job opportunities in government and public sector undertakings, banks, central government institutes etc.	CO 1 - To apply C++ features to program design and implementation. CO 2 - To explain object oriented concepts and describe how they are supported by C++. CO 3 - To use C++ to demonstrate practical experience in developing object oriented solutions. CO 4 - To design and implement programs using C++. CO 5 - To analyze a problem description and design object oriented software using good coding practices and techniques. CO 6 - To implement an achievable practical applications and analyze issues related to object oriented techniques in the C++ programming language. CO 7 - To use common software patterns in object oriented design and recognize their applicability to other software development contexts. CO 8 - To create application using C++ programming language. CO 9 - To write algorithm for programs.
143	MSK175	Mathematics for Competitive Examination - I				☑	PO 1 - To apply the acquired scientific knowledge to face day to day needs. PO 3 - To carry out field works and projects independently and in collaboration with other institutions and industries. PO 5 - To face challenging competitive examinations that offer rewarding careers in science and education.	PSO 1 - To acquire a strong foundation in various branches of mathematics to formulate real life problems into mathematical models. PSO 2 - To develop problem solving skills, cultivating logical thinking, and face competitive examinations with confidence. PSO 3 - To enhance numerical ability and address problems in interdisciplinary areas which would help in project and field works. PSO 4 - To apply the mathematical knowledge and skills to face competitive examination with confidence. PSO 5 - To pursue higher studies which in turn will offer them job opportunities in government and public sector undertakings, banks, central government institutes etc.	CO 1 - To recall the problems on percentage. CO 2 - To discuss the problems on population and depreciation. CO 3 - To conversion of decimal into percentage and vice versa. CO 4 - To use percentage concept to solve applied technical problems. CO 5 - To analyze the problems related to inlet and outlet of the tank. CO 6 - To evaluate time and distance related problems. CO 7 - To create the ability to make an appropriate mixture.

#	Code	Course			PO	PSO	CO
144	MC1761	Major Core X: Complex Analysis	☑		PO 1 - To apply the acquired scientific knowledge to face day to day needs. PO 3 - To carry out field works and projects independently and in collaboration with other institutions and industries. PO 5 - To face challenging competitive examinations that offer rewarding careers in science and education.	PSO 1 - To acquire a strong foundation in various branches of mathematics to formulate real life problems into mathematical models. PSO 3 - To enhance numerical ability and address problems in interdisciplinary areas which would help in project and field works. PSO 4 - To apply the mathematical knowledge and skills to face competitive examination with confidence. PSO 8 - To apply knowledge of principles, concepts and results in specific subject area to analyze their local and global impact.	CO 1 - To understand the geometric representation of complex numbers. CO 2 - To use differentiation rules to compute derivatives and express complex- differentiable functions as power series. CO 3 - To compute line integrals by using Cauchy's integral theorem and formula. CO 4 - To identify the isolated singularities of a function and determine whether they are removable, poles or essential. CO 5 - To evaluate definite integrals by using residues theorem.
145	MC1762	Major Core XI: Mechanics	☑		PO 1 - To apply the acquired scientific knowledge to face day to day needs. PO 4 - To reflect upon green initiatives and take responsible steps to build a sustainable environment. PO 5 - To face challenging competitive examinations that offer rewarding careers in science and education. PO 7 - To equip students with hands on training through various courses to enhance entrepreneurship skills.	PSO 1 - To acquire a strong foundation in various branches of mathematics to formulate real life problems into mathematical models. PSO 2 - To develop problem solving skills, cultivating logical thinking, and face competitive examinations with confidence. PSO 4 - To apply the mathematical knowledge and skills to face competitive examination with confidence. PSO 6 - To develop entrepreneurial skills, become empowered and self-dependent in society. PSO 7 - To understand the professional, ethical, legal, security, social issues and responsibilities.	CO 1 - To calculate the reactions necessary to ensure static equilibrium. CO 2 - To apply the principles of static equilibrium to particles and rigid bodies. CO 3 - To understand the ways of distributing loads. CO 4 - To identify internal forces and moments of a rigid body. CO 5 - To apply the basic principles of projectiles into real world problems. CO 6 - To classify the laws of friction. CO 7 - To describe energy methods for particles and systems of particles. CO 8 - To understand the general principles of dynamics. CO 9 - To differentiate the various frictional forces
146	MC1763	Major Core XII: Number Theory	☑		PO 1 - To apply the acquired scientific knowledge to face day to day needs. PO 3 - To carry out field works and projects independently and in collaboration with other institutions and industries.	PSO 1 - To acquire a strong foundation in various branches of mathematics to formulate real life problems into mathematical models. PSO 2 - To develop problem solving skills, cultivating logical thinking, and face competitive examinations with confidence. PSO 3 - To enhance numerical ability and address problems in interdisciplinary areas which would help in project and field works. PSO 5 - To pursue higher studies which in turn will offer them job opportunities in government and public sector undertakings, banks, central government institutes etc. PSO 6 - To develop entrepreneurial skills, become empowered and self-dependent in society. PSO 7 - To understand the professional, ethical, legal, security, social issues and responsibilities. PSO 8 - To apply knowledge of principles, concepts and results in specific subject area to analyze their local and global impact.	CO 1 - To express the concepts and results of divisibility of integers effectively. CO 2 - To construct mathematical proofs of theorems and find counter examples for false statements. CO 3 - To collect and use numerical data to form conjectures about the integers. CO 4 - To understand the logic and methods behind the major proofs in Number Theory. CO 5 - To solve challenging problems related to Chinese remainder theorem effectively. CO 6 - To build up the basic theory of the integers from a list of axioms. CO 7 - To explore some current research problems in number theory. CO 8 - To apply Fermat's theorem and Wilsons theorem effectively. CO 9 - To use mathematical induction and other types of proof writing techniques CO 10 - To understand and utilize mathematical functions and empirical principles and processes
147	MC1764	Major Core XIII: Operations Research	☑		PO 1 - To apply the acquired scientific knowledge to face day to day needs. PO 3 - To carry out field works and projects independently and in collaboration with other institutions and industries. PO 5 - To face challenging competitive examinations that offer rewarding careers in science and education.	PSO 1 - To acquire a strong foundation in various branches of mathematics to formulate real life problems into mathematical models. PSO 3 - To enhance numerical ability and address problems in interdisciplinary areas which would help in project and field works. PSO 4 - To apply the mathematical knowledge and skills to face competitive examination with confidence.	CO 1 - To understand the origin and development of Operations Research. CO 2 - To explain what is an LPP. CO 3 - To define how to formulate an LPP with linear constraints. CO 4 - To maximize the profit, minimize the cost, minimize the time in transportation problem , Travelling salesman problem, Assignment problem. CO 5 - To identify a problem in your locality, formulate it as an LPP and solve.
148	MC1765	Elective II: a) Astronomy		☑	PO 1 - To apply the acquired scientific knowledge to face day to day needs. PO 5 - To face challenging competitive examinations that offer rewarding careers in science and education.	PSO 1 - To acquire a strong foundation in various branches of mathematics to formulate real life problems into mathematical models. PSO 2 - To develop problem solving skills, cultivating logical thinking, and face competitive examinations with confidence. PSO 4 - To apply the mathematical knowledge and skills to face competitive examination with confidence.	CO 1 - To define the spherical trigonometry of the celestial sphere. CO 2 - To discuss the Kepler's laws. CO 3 - To calculate the maximum and minimum number of eclipses near a node in a year. CO 4 - To interpret latitude and longitude and apply this to find the latitude and longitude of a particular place. CO 5 - To distinguish between geometric parallax and horizontal parallax.
149	MC1766	Elective II: b) Boolean Algebra	☑		PO 1 - To apply the acquired scientific knowledge to face day to day needs. PO 5 - To face challenging competitive examinations that offer rewarding careers in science and education.	PSO 1 - To acquire a strong foundation in various branches of mathematics to formulate real life problems into mathematical models. PSO 2 - To develop problem solving skills, cultivating logical thinking, and face competitive examinations with confidence. PSO 5 - To pursue higher studies which in turn will offer them job opportunities in government and public sector undertakings, banks, central government institutes etc.	CO 1 - To discuss the primary concepts of Lattices and Boolean algebra. CO 2 - To recognize upper bound, lower bound, greatest lower bound. CO 3 - To differentiate between lattices and complete lattices. CO 4 - To relate the concepts of lattice homomorphism and isomorphism. CO 5 - To formulate problems in Lattices and Boolean Algebra.

#	Code	Course						PO	PSO	CO
150	MC1767	Elective II: c) Web Designing with HTML		☑				PO 1 - To apply the acquired scientific knowledge to face day to day needs. PO 5 - To face challenging competitive examinations that offer rewarding careers in science and education.	PSO 1 - To acquire a strong foundation in various branches of mathematics to formulate real life problems into mathematical models. PSO 2 - To develop problem solving skills, cultivating logical thinking, and face competitive examinations with confidence. PSO 4 - To apply the mathematical knowledge and skills to face competitive examination with confidence.	CO 1 - To define modern protocols and systems used on the web(such as HTML,HTTP). CO 2 - To employ fundamental knowledge on web designing with makeup language. CO 3 - To gain strong knowledge in HTML. CO 4 - To use critical thinking skills to design and implement an interactive websites with regard to issues of usability, accessibility and internationalism. CO 5 - To pursue future courses in website development and design.
151	MSK176	Skill Based Course: Mathematics for Competitive Examination - II			☑			PO 1 - To apply the acquired scientific knowledge to face day to day needs. PO 5 - To face challenging competitive examinations that offer rewarding careers in science and education.	PSO 1 - To acquire a strong foundation in various branches of mathematics to formulate real life problems into mathematical models. PSO 2 - To develop problem solving skills, cultivating logical thinking, and face competitive examinations with confidence. PSO 4 - To apply the mathematical knowledge and skills to face competitive examination with confidence. PSO 5 - To pursue higher studies which in turn will offer them job opportunities in government and public sector undertakings, banks, central government institutes etc.	CO 1 - To recognize the difference between volume and surface areas. CO 2 - To demonstrate the basic concepts of Compound interest. CO 3 - To apply analytical techniques to solve stocks and shares problems. CO 4 - To calculate time taken by the train to pass a pole and similar problems. CO 5 - To compare the surface areas of cuboid and cube. CO 6 - To evaluate the volume of cylinder. CO 7 - To measure the surface area of the sphere. CO 8 - To examine the face value and market value.
152	PM2011	Core I: Algebra I					☑	PO 1 - To prepare successful professionals in industry, government, academia, research, entrepreneurial pursuits and consulting firms. PO 2 - To face and succeed in high level competitive examinations like NET, GATE and TOFEL. PO 3 - To carry out internship programmes and research projects to develop scientific skills and innovative ideas. PO 4 - To utilize the obtained scientific knowledge to create eco-friendly environment.	PSO 1 - To utilize the knowledge gained for entrepreneurial pursuits. PSO 2 - To sharpen their analytical thinking, logical deductions and rigor in reasoning. PSO 3 - To use the techniques, skills and modern technology necessary to communicate effectively with professional and ethical responsibilities. PSO 4 - To understand the applications of mathematics in a global economic environmental and social context.	CO 1 - To understand the fundamental concepts of abstract algebra and give illustrations. CO 2 - To analyze and demonstrate examples of various Sylow p- subgroups, automorphisms, conjugate classes, finite abelian groups, characteristic subgroups, rings, ideals, Euclidean domain, Factorization domain. CO 3 - To develop proofs for Sylow's theorems, finite abelian groups, direct products, Cauchy's theorem, Cayley's Theorem, automorphisms for groups. CO 4 - To develop the way of embedding of rings and design proofs for theorems related to rings, polynomial rings, Division Algorithm, Gauss' lemma and Eisenstein Criterion. CO 5 - To apply the concepts of Cayley's theorem, Counting principles, Sylow's theorems, Rings and Ideals in the structure of certain groups of small order. CO 6 - To compare Euclidean domain and Unique factorization domain, Polynomial Rings, Polynomial Rings over Commutative Rings and various concepts in Abstract Algebra.
153	PM2012	Core II: Analysis I					☑	PO 1 - To prepare successful professionals in industry, government, academia, research, entrepreneurial pursuits and consulting firms. PO 2 - To face and succeed in high level competitive examinations like NET, GATE and TOFEL. PO 3 - To carry out internship programmes and research projects to develop scientific skills and innovative ideas. PO 4 - To utilize the obtained scientific knowledge to create eco-friendly environment.	PSO 1 - To utilize the knowledge gained for entrepreneurial pursuits. PSO 2 - To sharpen their analytical thinking, logical deductions and rigour in reasoning. PSO 3 - To use the techniques, skills and modern technology necessary to communicate effectively with professional and ethical responsibilities. PSO 4 - To understand the applications of mathematics in a global economic environmental and social context.	CO 1 - To explain the fundamental concepts of analysis and their role in modern mathematics. CO 2 - To deal with various examples of metric space, compact sets and completeness in Euclidean space. CO 3 - To utilize the techniques for testing the convergence of sequence and series. CO 4 - To understand the important theorems such as Intermediate valued theorem, Mean value theorem, Roll's theorem, Taylor and L'Hospital theorem. CO 5 - To apply the concepts of differentiation in problems.
154	PM2013	Core III: Probability and Statistics					☑	PO 1 - To prepare successful professionals in industry, government, academia, research, entrepreneurial pursuits and consulting firms. PO 2 - To face and succeed in high level competitive examinations like NET, GATE and TOFEL. PO 3 - To carry out internship programmes and research projects to develop scientific skills and innovative ideas. PO 4 - To utilize the obtained scientific knowledge to create eco-friendly environment.	PSO 1 - To utilize the knowledge gained for entrepreneurial pursuits. PSO 2 - To sharpen their analytical thinking, logical deductions and rigour in reasoning. PSO 3 - To use the techniques, skills and modern technology necessary to communicate effectively with professional and ethical responsibilities. PSO 4 - To understand the applications of mathematics in a global economic environmental and social context.	CO 1 - To recall the basic probability axioms,conditional probability, random variables and related concepts. CO 2 - To compute marginal and conditional distributions and check the stochastic independence. CO 3 - To recall Binomial, Poisson and Normal distributions and learn new distributions such as multinomial, Chi square and Bivariate normal distributions. CO 4 - To learn the transformation technique for finding the p.d.f of functions of random variables and use these techniques to solve related problems. CO 5 - To employ the relevant concepts of analysis to determine limiting distributions of random variables. CO 6 - To learn Estimation, Point estimation and Confidence Intervals for Means, difference of means and variances. CO 7 - To design probability models to deal with real world problems and solve problems involving probabilistic situations.

155	PM2014	Core IV: Ordinary Differential Equations				☑	PO 1 - To prepare successful professionals in industry, government, academia, research, entrepreneurial pursuits and consulting firms. PO 2 - To face and succeed in high level competitive examinations like NET, GATE and TOFEL. PO 3 - To carry out internship programmes and research projects to develop scientific skills and innovative ideas. PO 4 - To utilize the obtained scientific knowledge to create eco-friendly environment.	PSO 1 - To utilize the knowledge gained for entrepreneurial pursuits. PSO 2 - To sharpen their analytical thinking, logical deductions and rigour in reasoning. PSO 3 - To use the techniques, skills and modern technology necessary to communicate effectively with professional and ethical responsibilities. PSO 4 - To understand the applications of mathematics in a global economic environmental and social context.	CO 1 - To recall the definitions of degree and order of differential equations and determine whether a system of functions is linearly independent using the Wronskian definition. CO 2 - To solve linear ordinary differential equations with constant coefficients by using power series expansion. CO 3 - To determine the solutions for a linear system of first order equations. CO 4 - To learn properties of Legendre polynomials and Properties of Bessel Functions. CO 5 - To analyze the concepts of existence and uniqueness of solutions of the ordinary differential equations. CO 6 - To create differential equations for a large number of real world problems.
156	PM2015	Elective I: a) Numerical Analysis				☑	PO 1 - To prepare successful professionals in industry, government, academia, research, entrepreneurial pursuits and consulting firms. PO 2 - To face and succeed in high level competitive examinations like NET, GATE and TOFEL. PO 3 - To carry out internship programmes and research projects to develop scientific skills and innovative ideas. PO 4 - To utilize the obtained scientific knowledge to create eco-friendly environment.	PSO 1 - To utilize the knowledge gained for entrepreneurial pursuits. PSO 2 - To sharpen their analytical thinking, logical deductions and rigour in reasoning. PSO 3 - To use the techniques, skills and modern technology necessary to communicate effectively with professional and ethical responsibilities. PSO 4 - To understand the applications of mathematics in a global economic environmental and social context.	CO 1 - To recall the methods of finding the roots of the algebraic and transcendental equations. CO 2 - To understand the significance of the finite, forward, backward and central differences and their properties. CO 3 - To learn the procedures of fitting straight lines and curves. CO 4 - To compute the solutions of a system of equations by using appropriate numerical methods. CO 5 - To solve the problems in ODE by using Taylor's series method, Euler's method etc.
157	PM2016	Elective I: b)Fuzzy Sets and Fuzzy Logic				☑	PO 1 - To prepare successful professionals in industry, government, academia, research, entrepreneurial pursuits and consulting firms. PO 2 - To face and succeed in high level competitive examinations like NET, GATE and TOFEL. PO 3 - To carry out internship programmes and research projects to develop scientific skills and innovative ideas. PO 4 - To utilize the obtained scientific knowledge to create eco-friendly environment.	PSO 1 - To utilize the knowledge gained for entrepreneurial pursuits. PSO 2 - To sharpen their analytical thinking, logical deductions and rigour in reasoning. PSO 3 - To use the techniques, skills and modern technology necessary to communicate effectively with professional and ethical responsibilities. PSO 4 - To understand the applications of mathematics in a global economic environmental and social context.	CO 1 - To define and explain the fundamental concepts of fuzzy set theory, including membership functions, fuzzy set operations (union, intersection, complement), and the extension principle. CO 2 - To identify and analyze real-world problems where fuzzy logic can be applied effectively. CO 3 - To design fuzzy logic systems for specific applications, such as fuzzy controllers for industrial processes or fuzzy decision-making systems. CO 4 - To understand the components of a fuzzy inference system and implementing rule-based fuzzy systems for various applications. CO 5 - To understand how to use fuzzy logic to control variables in dynamic systems, such as temperature control in HVAC systems or speed control in robotics. CO 6 - To be familiar with software tools and programming languages commonly used for implementing fuzzy logic systems, such as MATLAB. CO 7 - To use these tools to simulate and solve fuzzy logic problems.
158	PM2021	Core V: Modules and Vector Spaces				☑	PO 1 - To prepare successful professionals in industry, government, academia, research, entrepreneurial pursuits and consulting firms. PO 2 - To face and succeed in high level competitive examinations like NET, GATE and TOFEL. PO 3 - To carry out internship programmes and research projects to develop scientific skills and innovative ideas. PO 4 - To utilize the obtained scientific knowledge to create eco-friendly environment.	PSO 1 - To utilize the knowledge gained for entrepreneurial pursuits. PSO 2 - To sharpen their analytical thinking, logical deductions and rigour in reasoning. PSO 3 - To use the techniques, skills and modern technology necessary to communicate effectively with professional and ethical responsibilities. PSO 4 - To understand the applications of mathematics in a global economic environmental and social context.	CO 1 - To recall the definitions and properties of Vector Spaces and Subspaces. CO 2 - To analyze the concepts Linear Independence, Dependence and Basis. CO 3 - To apply the definition and properties of Linear transformation and Matrices of Linear transformation. CO 4 - To gain knowledge about characteristic polynomial, eigen vectors, eigen values and eigen spaces as well as the geometric and the algebraic multiplicities of an eigen value. CO 5 - To learn and apply Jordan form and triangular form for computations.
159	PM2022	Core VI: Analysis II				☑	PO 1 - To prepare successful professionals in industry, government, academia, research, entrepreneurial pursuits and consulting firms. PO 2 - To face and succeed in high level competitive examinations like NET, GATE and TOFEL. PO 3 - To carry out internship programmes and research projects to develop scientific skills and innovative ideas. PO 4 - To utilize the obtained scientific knowledge to create eco-friendly environment.	PSO 1 - To utilize the knowledge gained for entrepreneurial pursuits. PSO 2 - To sharpen their analytical thinking, logical deductions and rigour in reasoning. PSO 3 - To use the techniques, skills and modern technology necessary to communicate effectively with professional and ethical responsibilities. PSO 4 - To understand the applications of mathematics in a global economic environmental and social context.	CO 1 - To recall the definition of continuity, boundedness and some results on uniform convergence. CO 2 - To recognise the difference between pointwise and uniform convergence of a sequence of functions and Riemann Stieltjes integrals. CO 3 - To understand the close relation between equicontinuity and uniform convergence of sequence of continuous function and rectifiable curves. CO 4 - To learn Parseval's theorem, Stone Weierstrass theorem and know about its physical significance in terms of the power of the Fourier components. CO 5 - To utilize the definition of differentiation and partial derivative of function of several variables to solve problems. CO 6 - To interpret the concept of the contraction principle and the inverse function theorem.

160	PM2023	Core VII: Partial Differential Equations				☑	PO 1 - To prepare successful professionals in industry, government, academia, research, entrepreneurial pursuits and consulting firms. PO 2 - To face and succeed in high level competitive examinations like NET, GATE and TOFEL. PO 3 - To carry out internship programmes and research projects to develop scientific skills and innovative ideas. PO 4 - To utilize the obtained scientific knowledge to create eco-friendly environment.	PSO 1 - To utilize the knowledge gained for entrepreneurial pursuits. PSO 2 - To sharpen their analytical thinking, logical deductions and rigour in reasoning. PSO 3 - To use the techniques, skills and modern technology necessary to communicate effectively with professional and ethical responsibilities. PSO 4 - To understand the applications of mathematics in a global economic environmental and social context.	CO 1 - To recall the definitions of complete integral, particular integral and singular integrals. CO 2 - To learn some methods to solve the problems of non-linear first order partial differential equations. homogeneous and non homogeneous linear partial differential equations with constant coefficients and solve related problems. CO 3 - To analyze the classification of partial differential equations in three independent variables – cauchy's problem for a second order partial differential equations. CO 4 - To solve the boundary value problem for the heat equations and the wave equation. CO 5 - To apply the concepts and methods in physical processes like heat transfer and electrostatics.
161	PM2024	Core VIII: Graph Theory				☑	PO 1 - To prepare successful professionals in industry, government, academia, research, entrepreneurial pursuits and consulting firms. PO 2 - To face and succeed in high level competitive examinations like NET, GATE and TOFEL. PO 3 - To carry out internship programmes and research projects to develop scientific skills and innovative ideas. PO 4 - To utilize the obtained scientific knowledge to create eco-friendly environment.	PSO 1 - To utilize the knowledge gained for entrepreneurial pursuits. PSO 2 - To sharpen their analytical thinking, logical deductions and rigour in reasoning. PSO 3 - To use the techniques, skills and modern technology necessary to communicate effectively with professional and ethical responsibilities. PSO 4 - To understand the applications of mathematics in a global economic environmental and social context.	CO 1 - To identify cut vertices and understand various versions of connectedness of a graph. CO 2 - To understand the concept of Digraphs and characterize Eulerian Digraphs. CO 3 - To recall the definitions of Matchings and design proof for characterization of graphs containing a 1-factor. CO 4 - To solve problems involving coloring and learn necessary conditions for planar graphs. CO 5 - To learn the basic definitions of domination and review the concept of distance in a graph.
162	PM2025	Elective II: a) Classical Dynamics				☑	PO 1 - To prepare successful professionals in industry, government, academia, research, entrepreneurial pursuits and consulting firms. PO 2 - To face and succeed in high level competitive examinations like NET, GATE and TOFEL. PO 4 - To utilize the obtained scientific knowledge to create eco-friendly environment.	PSO 1 - To utilize the knowledge gained for entrepreneurial pursuits. PSO 2 - To sharpen their analytical thinking, logical deductions and rigour in reasoning. PSO 4 - To understand the applications of mathematics in a global economic environmental and social context.	CO 1 - To recall the concepts of Newton's laws of motion, momentum, acceleration, motion of a particle. CO 2 - To understand the generalized co-ordinates of the Mechanical system. CO 3 - To apply D'Alembert's Principle to solve the problems involving system of particles. CO 4 - To solve the Newton's equations for simple configuration using various methods. CO 5 - To transform the Lagrangian equations to Hamiltonian equations. CO 6 - To define the canonical transformations and Lagrange and Poisson brackets. CO 7 - To evaluate the system of particles by deriving the Jacobi equation and Jacobi's theorem. CO 8 - To understand the foundation of Hamilton's Principle and differential forms.
163	PM2026	Elective II: b) Differential Geometry				☑	PO 1 - To prepare successful professionals in industry, government, academia, research, entrepreneurial pursuits and consulting firms. PO 2 - To face and succeed in high level competitive examinations like NET, GATE and TOFEL. PO 3 - To carry out internship programmes and research projects to develop scientific skills and innovative ideas.	PSO 1 - To utilize the knowledge gained for entrepreneurial pursuits. PSO 2 - To sharpen their analytical thinking, logical deductions and rigour in reasoning. PSO 3 - To use the techniques, skills and modern technology necessary to communicate effectively with professional and ethical responsibilities.	CO 1 - To describe and analyze curves and surfaces in three-dimensional space, including their shapes, curvature, and parametric representations. CO 2 - To compute tangent vectors and normal curvature at any point on a curve or surface, enabling you to understand how objects bend and twist. CO 3 - To analyze and compute these important geometric concepts. CO 4 - To gain proficiency in Riemannian metrics, which are used to measure distances and angles on curved surfaces. CO 5 - To apply the principles of differential geometry to solve practical problems in fields such as computer graphics, robotics, and general relativity, enhancing your problem-solving skills.
164	PM2031	Core IX: Field Theory and Lattices				☑	PO 1 - To prepare successful professionals in industry, government, academia, research, entrepreneurial pursuits and consulting firms. PO 2 - To face and succeed in high level competitive examinations like NET, GATE and TOFEL. PO 3 - To carry out internship programmes and research projects to develop scientific skills and innovative ideas. PO 4 - To utilize the obtained scientific knowledge to create eco-friendly environment.	PSO 1 - To utilize the knowledge gained for entrepreneurial pursuits. PSO 2 - To sharpen their analytical thinking, logical deductions and rigour in reasoning. PSO 3 - To use the techniques, skills and modern technology necessary to communicate effectively with professional and ethical responsibilities. PSO 4 - To understand the applications of mathematics in a global economic environmental and social context.	CO 1 - To recall the definitions and basic concepts of field theory and lattice theory. CO 2 - To express the fundamental concepts of field theory, Galois theory. CO 3 - To demonstrate the use of Galois theory to construct Galois group over the rationals. CO 4 - To distinguish between field theory and Galois theory. CO 5 - To interpret distributivity and modularity and apply these concepts in Boolean Algebra. CO 6 - To understand the theory of Frobenius Theorem. CO 7 - To develop the knowledge of lattices and establish new relationships in Boolean Algebra.
165	PM2032	Core X: Topology				☑	PO 1 - To prepare successful professionals in industry, government, academia, research, entrepreneurial pursuits and consulting firms. PO 2 - To face and succeed in high level competitive examinations like NET, GATE and TOFEL. PO 3 - To carry out internship programmes and research projects to develop scientific skills and innovative ideas. PO 4 - To utilize the obtained scientific knowledge to create eco-friendly environment.	PSO 1 - To utilize the knowledge gained for entrepreneurial pursuits. PSO 2 - To sharpen their analytical thinking, logical deductions and rigour in reasoning. PSO 3 - To use the techniques, skills and modern technology necessary to communicate effectively with professional and ethical responsibilities. PSO 4 - To understand the applications of mathematics in a global economic environmental and social context.	CO 1 - To understand the definitions of topological space, closed sets, limit points, continuity, connectedness, compactness, separation axioms and countability axioms. CO 2 - To construct a topology on a set so as to make it into a topological space. CO 3 - To distinguish the various topologies such as product and box topologies and topological spaces such as normal and regular spaces. CO 4 - To compare the concepts of components and path components, connectedness and local connectedness and countability axioms. CO 5 - To apply the various theorems related to regular space, normal space, Hausdorff space, compact space to other branches of mathematics. CO 6 - To construct continuous functions, homeomorphisms and projection mappings.

#	Code	Course					PO	PSO	CO
166	PM2033	Core XI: Measure Theory and Integration				☑	PO 1 - To prepare successful professionals in industry, government, academia, research, entrepreneurial pursuits and consulting firms. PO 2 - To face and succeed in high level competitive examinations like NET, GATE and TOFEL. PO 3 - To carry out internship programmes and research projects to develop scientific skills and innovative ideas. PO 4 - To utilize the obtained scientific knowledge to create eco-friendly environment.	PSO 1 - To utilize the knowledge gained for entrepreneurial pursuits. PSO 2 - To sharpen their analytical thinking, logical deductions and rigour in reasoning. PSO 3 - To use the techniques, skills and modern technology necessary to communicate effectively with professional and ethical responsibilities. PSO 4 - To understand the applications of mathematics in a global economic environmental and social context.	CO 1 - To define the concept of measures and Vitali covering and recall some properties of convergence of functions. CO 2 - To cite examples of measurable sets , measurable functions, Riemann integrals, Lebesgue integrals. CO 3 - To apply measures and Lebesgue integrals to various measurable sets and measurable functions. CO 4 - To apply outer measure, differentiation and integration to intervals , functions and sets. CO 5 - To compare the different types of measures and Signed measures. CO 6 - To construct Lp spaces and outer measurable sets.
167	PM2034	Elective III: a) Algebraic Number Theory and Cryptography				☑	PO 1 - To prepare successful professionals in industry, government, academia, research, entrepreneurial pursuits and consulting firms. PO 2 - To face and succeed in high level competitive examinations like NET, GATE and TOFEL. PO 3 - To carry out internship programmes and research projects to develop scientific skills and innovative ideas. PO 4 - To utilize the obtained scientific knowledge to create eco-friendly environment.	PSO 1 - To utilize the knowledge gained for entrepreneurial pursuits. PSO 2 - To sharpen their analytical thinking, logical deductions and rigour in reasoning. PSO 3 - To use the techniques, skills and modern technology necessary to communicate effectively with professional and ethical responsibilities. PSO 4 - To understand the applications of mathematics in a global economic environmental and social context.	CO 1 - To recall the basic results of field theory. CO 2 - To understand quadratic and power series forms and Jacobi symbol. CO 3 - To apply binary quadratic forms for the decomposition of a number into sum of sequences. CO 4 - To determine solutions using Arithmetic Functions. CO 5 - To calculate the possible partitions of a given number and draw Ferrer's graph. CO 6 - To identify the public key using Cryptography.
168	PM2035	Elective III: b) Stochastic Process				☑	PO 1 - To prepare successful professionals in industry, government, academia, research, entrepreneurial pursuits and consulting firms. PO 2 - To face and succeed in high level competitive examinations like NET, GATE and TOFEL. PO 3 - To carry out internship programmes and research projects to develop scientific skills and innovative ideas. PO 4 - To utilize the obtained scientific knowledge to create eco-friendly environment.	PSO 1 - To utilize the knowledge gained for entrepreneurial pursuits. PSO 2 - To sharpen their analytical thinking, logical deductions and rigour in reasoning. PSO 3 - To use the techniques, skills and modern technology necessary to communicate effectively with professional and ethical responsibilities. PSO 4 - To understand the applications of mathematics in a global economic environmental and social context.	CO 1 - To recall the concept of the theory of probability. CO 2 - To understand the definitions and specification of stochastic processes. CO 3 - To differentiate between different states of Markov system. CO 4 - To categorize different stochastic processes such as Poisson processes, Yule- Fury processes, birth and death processes. CO 5 - To calculate residual and current life times using renewal processes. CO 6 - To select the suitable queuing model in real life situations. CO 7 - To apply the theory to create the correct stochastic model for a given problem.
169	PM20PR	Major: Project	☑	☑	☑	☑	PO 1 - To prepare successful professionals in industry, government, academia, research, entrepreneurial pursuits and consulting firms. PO 2 - To face and succeed in high level competitive examinations like NET, GATE and TOFEL. PO 3 - To carry out internship programmes and research projects to develop scientific skills and innovative ideas. PO 4 - To utilize the obtained scientific knowledge to create eco-friendly environment.	PSO 1 - To utilize the knowledge gained for entrepreneurial pursuits. PSO 2 - To sharpen their analytical thinking, logical deductions and rigour in reasoning. PSO 3 - To use the techniques, skills and modern technology necessary to communicate effectively with professional and ethical responsibilities. PSO 4 - To understand the applications of mathematics in a global economic environmental and social context.	CO 1 - To choose a new topic of their interest. CO 2 - To develop the attitude of studying a topic in depth independently. CO 3 - To express their views with confidence in a group. CO 4 - To relate with the group members and reap the best harvest. CO 5 - To develop communication skills through oral presentation. CO 6 - To create a taste for research in mathematics. CO 7 - To develop confidence to face interviews. CO 8 - To interpret and analyze data mathematically.
170	PM20S1	Self Learning Course: Algebra for SET/CSIR-NET Exam		☑			PO 1 - To prepare successful professionals in industry, government, academia, research, entrepreneurial pursuits and consulting firms. PO 2 - To face and succeed in high level competitive examinations like NET, GATE and TOFEL. PO 3 - To carry out internship programmes and research projects to develop scientific skills and innovative ideas. PO 4 - To utilize the obtained scientific knowledge to create eco-friendly environment.	PSO 1 - To utilize the knowledge gained for entrepreneurial pursuits. PSO 2 - To sharpen their analytical thinking, logical deductions and rigour in reasoning. PSO 3 - To use the techniques, skills and modern technology necessary to communicate effectively with professional and ethical responsibilities. PSO 4 - To understand the applications of mathematics in a global economic environmental and social context.	CO 1 - To solve the problems based on vector spaces, subspaces and linear transformations. CO 2 - To understand the significant of linear independence, basis and dimensions. CO 3 - To recall matrix theory, linear equations and finding the rank and determine the determinant of matrices. CO 4 - To determine eigen values and eigen vectors and recall cayley-hamilton theorem. CO 5 - To acquire knowledge in solving problems by using matrix representation of linear transformations and change of basis. CO 6 - To differentiate various forms in matrices. CO 7 - To solve problems in inner product spaces, orthonormal basis and quadratic forms.
171	PM2041	Core XII: Complex Analysis				☑	PO 1 - To prepare successful professionals in industry, government, academia, research, entrepreneurial pursuits and consulting firms. PO 2 - To face and succeed in high level competitive examinations like NET, GATE and TOFEL. PO 3 - To carry out internship programmes and research projects to develop scientific skills and innovative ideas. PO 4 - To utilize the obtained scientific knowledge to create eco-friendly environment.	PSO 1 - To utilize the knowledge gained for entrepreneurial pursuits. PSO 2 - To sharpen their analytical thinking, logical deductions and rigour in reasoning. PSO 3 - To use the techniques, skills and modern technology necessary to communicate effectively with professional and ethical responsibilities. PSO 4 - To understand the applications of mathematics in a global economic environmental and social context.	CO 1 - To understand the fundamental concepts of complex variable theory. CO 2 - To effectively locate and use the information needed to prove theorems and establish mathematical results. CO 3 - To demonstrate the ability to integrate knowledge and ideas of complex differentiation and complex integration. CO 4 - To use appropriate techniques for solving related problems and for establishing theoretical results. CO 5 - To evaluate complicated real integrals through residue theorem. CO 6 - To know the theory of conformal mappings which has many physical applications and analyse its concepts.

172	PM2042	Core XIII: Functional Analysis			☑	PO 1 - To prepare successful professionals in industry, government, academia, research, entrepreneurial pursuits and consulting firms. PO 2 - To face and succeed in high level competitive examinations like NET, GATE and TOFEL. PO 4 - To utilize the obtained scientific knowledge to create eco-friendly environment.	PSO 1 - To utilize the knowledge gained for entrepreneurial pursuits. PSO 2 - To sharpen their analytical thinking, logical deductions and rigour in reasoning. PSO 4 - To understand the applications of mathematics in a global economic environmental and social context.	CO 1 - To learn and understand the definition of linear space, normed linear space, Banach Space and their examples. CO 2 - To explain the concept of different properties of Banach Spaces, Hahn Banach theorem. CO 3 - To compare different types of operators and their properties, Natural imbedding. CO 4 - To explain the ideas needed for open mapping theorem , Open Mapping theorem. CO 5 - To construct the idea of projections , the spectrum of an operator and develop problem solving skills , Matrices, Determinants. CO 6 - To learn and understand the definition of Hilbert Spaces ,Orthogonal Complements. CO 7 - To explain the concept of the adjoint of an operator, Normal and Unitary operators, Spectral Theory.
173	PM2043	Core XIV: Operations Research			☑	PO 1 - To prepare successful professionals in industry, government, academia, research, entrepreneurial pursuits and consulting firms. PO 2 - To face and succeed in high level competitive examinations like NET, GATE and TOFEL. PO 3 - To carry out internship programmes and research projects to develop scientific skills and innovative ideas.	PSO 1 - To utilize the knowledge gained for entrepreneurial pursuits. PSO 2 - To sharpen their analytical thinking, logical deductions and rigour in reasoning. PSO 3 - To use the techniques, skills and modern technology necessary to communicate effectively with professional and ethical responsibilities.	CO 1 - To explain the fundamental concept of DP model , Inventory model and Queuing model. CO 2 - To relate the concepts of Arrow (Network)diagram representations, in critical path calculations and construction of the Time chart. CO 3 - To distinguish deterministic model and single item. CO 4 - To interpret Poisson and Exponential distributions and apply these concepts in Queuing models. CO 5 - To solve life oriented decision making problems by optimizing the objective function.
174	PM2044	Core XV: Algorithmic Graph Theory			☑	PO 1 - To prepare successful professionals in industry, government, academia, research, entrepreneurial pursuits and consulting firms. PO 2 - To face and succeed in high level competitive examinations like NET, GATE and TOFEL. PO 3 - To carry out internship programmes and research projects to develop scientific skills and innovative ideas.	PSO 1 - To utilize the knowledge gained for entrepreneurial pursuits. PSO 2 - To sharpen their analytical thinking, logical deductions and rigour in reasoning. PSO 3 - To use the techniques, skills and modern technology necessary to communicate effectively with professional and ethical responsibilities.	CO 1 - To understand basic algorithms and write algorithms for simple computing. CO 2 - To analyse the efficiency of the algorithm. CO 3 - To understand and analyze algorithmic techniques to study basic parameters and properties of graphs. CO 4 - To use effectively techniques from graph theory, to solve practical problems in networking and communication.
175	PM2045	Elective IV: a) Combinatorics			☑	PO 1 - To prepare successful professionals in industry, government, academia, research, entrepreneurial pursuits and consulting firms. PO 2 - To face and succeed in high level competitive examinations like NET, GATE and TOFEL. PO 3 - To carry out internship programmes and research projects to develop scientific skills and innovative ideas. PO 4 - To utilize the obtained scientific knowledge to create eco-friendly environment.	PSO 1 - To utilize the knowledge gained for entrepreneurial pursuits. PSO 2 - To sharpen their analytical thinking, logical deductions and rigour in reasoning. PSO 3 - To use the techniques, skills and modern technology necessary to communicate effectively with professional and ethical responsibilities. PSO 4 - To understand the applications of mathematics in a global economic environmental and social context.	CO 1 - To discuss the basic concepts in permutation and combination, Recurrence Relations, Generating functions, The Principle of Inclusion and Exclusion. CO 2 - To distinguish between permutation and combination, distribution of distinct and non-distinct objects. CO 3 - To correlate recurrence relation and generating function. CO 4 - To solving problems by the technique of generating functions, combinations, recurrence relations, the principle of inclusion and exclusion. CO 5 - To interpret the principles of inclusion and exclusion, equivalence classes and functions. CO 6 - To develop the concepts of Polya's fundamental theorem and apply in Polya's theory of counting.
176	PM2046	Elective IV: b) Coding Theory			☑	PO 1 - To prepare successful professionals in industry, government, academia, research, entrepreneurial pursuits and consulting firms. PO 2 - To face and succeed in high level competitive examinations like NET, GATE and TOFEL. PO 3 - To carry out internship programmes and research projects to develop scientific skills and innovative ideas. PO 4 - To utilize the obtained scientific knowledge to create eco-friendly environment.	PSO 1 - To utilize the knowledge gained for entrepreneurial pursuits. PSO 2 - To sharpen their analytical thinking, logical deductions and rigour in reasoning. PSO 3 - To use the techniques, skills and modern technology necessary to communicate effectively with professional and ethical responsibilities. PSO 4 - To understand the applications of mathematics in a global economic environmental and social context.	CO 1 - To explain the fundamental concepts of coding theory. CO 2 - To analyze the fundamental problems of coding theory and the properties of specific codes. CO 3 - To translate the fundamental problems to mathematical problems. CO 4 - To construct codes by various methods for the chosen problem. CO 5 - To solve the problems by recalling the concepts of finite field, polynomial rings and finite groups. CO 6 - To apply coding theory in transmission of information in telecommunication (cell phones, data modems etc,.). CO 7 - To design simple cyclic codes with given properties.
177	PM20S2	Self Learning Course: Analysis for SET/CSIR-NET Exam	☑			PO 2 - To face and succeed in high level competitive examinations like NET, GATE and TOFEL. PO 3 - To carry out internship programmes and research projects to develop scientific skills and innovative ideas. PO 4 - To utilize the obtained scientific knowledge to create eco-friendly environment.	PSO 1 - To utilize the knowledge gained for entrepreneurial pursuits. PSO 2 - To sharpen their analytical thinking, logical deductions and rigour in reasoning. PSO 3 - To use the techniques, skills and modern technology necessary to communicate effectively with professional and ethical responsibilities. PSO 4 - To understand the applications of mathematics in a global economic environmental and social context.	CO 1 - To recall the basic concepts of real number system, archimedian property, convergence and limit points. CO 2 - To acquire knowledge to solve problems based on compactness and connectedness. CO 3 - To understand the definitions and theorems on normed linear space and metric space. CO 4 - To evaluate simple concepts and solve problems related to continuity, uniform continuity and monotonic functions. CO 5 - To analyze the methods for solving problems in Riemann-integrals and improper integrals. CO 6 - To expand the sequences and series for the given problems. CO 7 - To compare convergence and uniform convergence and apply them in solving related problems.
		2020-2021						

No	Code	Course			PO	PSO	CO
178	MC2011	Major Core I: Differential Calculus and Trigonometry	☑		PO 1 - To equip students with hands on training through various courses to enhance entrepreneurship skills. PO 2 - To impart communicative skills and ethical values. PO 3 - To face challenging competitive examinations that offer rewarding careers in science and education. PO 4 - To apply the acquired scientific knowledge to face day to day needs and reflect upon green initiatives to build a sustainable environment.	PSO 1 - To acquire a strong foundation in various branches of mathematics to formulate real life problems into mathematical models. PSO 2 - To apply the mathematical knowledge and skills to develop problem solving skills cultivating logical thinking and face competitive examinations with confidence. PSO 3 - To develop entrepreneurial skills based on ethical values, become empowered and self-dependent in society. PSO 4 - To enhance numerical ability and address problems in interdisciplinary areas which would help in project and field works. PSO 5 - To pursue scientific research and develop new findings with global impact using latest technologies.	CO 1 - To recall the idea of derivative, rules of differentiation and understand the concept of p-r equation. CO 2 - To learn the concepts of curvature, circle of curvature, evolute and apply the concepts to solve problems. CO 3 - To recognize the rules of identifying asymptotes and employ the same to different curves. CO 4 - To acquire the knowledge about hyperbolic functions and compare it with circular functions, trigonometric functions, inverse trigonometric functions and their properties. CO 5 - To categorize the methods of finding the sum of trigonometric series.
179	MA2011	Allied I: Algebra and Calculus	☑		PO 1 - To equip students with hands on training through various courses to enhance entrepreneurship skills. PO 2 - To impart communicative skills and ethical values. PO 3 - To face challenging competitive examinations that offer rewarding careers in science and education. PO 4 - To apply the acquired scientific knowledge to face day to day needs and reflect upon green initiatives to build a sustainable environment.	PSO 1 - To acquire a strong foundation in various branches of mathematics to formulate real life problems into mathematical models. PSO 2 - To apply the mathematical knowledge and skills to develop problem solving skills cultivating logical thinking and face competitive examinations with confidence. PSO 3 - To develop entrepreneurial skills based on ethical values, become empowered and self-dependent in society. PSO 4 - To enhance numerical ability and address problems in interdisciplinary areas which would help in project and field works. PSO 5 - To pursue scientific research and develop new findings with global impact using latest technologies.	CO 1 - To recall the fundamentals of algebraic equations, matrices and rules of integration. CO 2 - To practice the formation of equations and compute symmetric functions of roots in terms of coefficients. CO 3 - To revise the properties of eigen values of the matrices. CO 4 - To learn Beta, Gamma functions and evaluate integrals using them. CO 5 - To practice the expansion of Fourier series and utilize the same for higher studies.
180	MNM201	Non Major Elective Course (NME): Quantitative Aptitude I		☑	PO 1 - To equip students with hands on training through various courses to enhance entrepreneurship skills. PO 3 - To face challenging competitive examinations that offer rewarding careers in science and education. PO 4 - To apply the acquired scientific knowledge to face day to day needs and reflect upon green initiatives to build a sustainable environment.	PSO 1 - To acquire a strong foundation in various branches of mathematics to formulate real life problems into mathematical models. PSO 2 - To apply the mathematical knowledge and skills to develop problem solving skills cultivating logical thinking and face competitive examinations with confidence. PSO 4 - To enhance numerical ability and address problems in interdisciplinary areas which would help in project and field works.	CO 1 - To apply BODMAS rule for simplification and determine missing numbers in a sequence. CO 2 - To express numbers in the base of a fraction of 100. CO 3 - To employ the problems related to the division of profit and loss of a business. CO 4 - To measure the relative magnitude of two quantities in an effective way. CO 5 - To construct and develop mathematical solutions to simple real life problems. CO 6 - To learn ratio and proportion and practice duplication and triplication of ratios.
181	MC2021	Major Core II: Classical Algebra and Integral Calculus	☑		PO 1 - To equip students with hands on training through various courses to enhance entrepreneurship skills. PO 2 - To impart communicative skills and ethical values. PO 3 - To face challenging competitive examinations that offer rewarding careers in science and education. PO 4 - To apply the acquired scientific knowledge to face day to day needs and reflect upon green initiatives to build a sustainable environment.	PSO 1 - To acquire a strong foundation in various branches of mathematics to formulate real life problems into mathematical models. PSO 2 - To apply the mathematical knowledge and skills to develop problem solving skills cultivating logical thinking and face competitive examinations with confidence. PSO 3 - To develop entrepreneurial skills based on ethical values, become empowered and self-dependent in society. PSO 4 - To enhance numerical ability and address problems in interdisciplinary areas which would help in project and field works. PSO 5 - To pursue scientific research and develop new findings with global impact using latest technologies.	CO 1 - To recall the fundamentals of algebraic equations and rules of integration. CO 2 - To apply fundamental theorem of algebra in framing and solving equations. CO 3 - To choose appropriate method for transformation of equations. CO 4 - To develop the skill of evaluation of double and triple integrals over different regions. CO 5 - To identify Beta, Gamma functions and utilize them for the evaluation of definite integrals. CO 6 - To develop the Fourier Series expansion in any interval and apply the same for solving technical and physical problems.
182	MA2021	Allied II: Vector Calculus and Differential Equations	☑		PO 1 - To equip students with hands on training through various courses to enhance entrepreneurship skills. PO 3 - To face challenging competitive examinations that offer rewarding careers in science and education. PO 4 - To apply the acquired scientific knowledge to face day to day needs and reflect upon green initiatives to build a sustainable environment.	PSO 1 - To acquire a strong foundation in various branches of mathematics to formulate real life problems into mathematical models. PSO 2 - To apply the mathematical knowledge and skills to develop problem solving skills cultivating logical thinking and face competitive examinations with confidence. PSO 4 - To enhance numerical ability and address problems in interdisciplinary areas which would help in project and field works. PSO 5 - To pursue scientific research and develop new findings with global impact using latest technologies.	CO 1 - To explain the physical meaning and properties of curl and divergence. CO 2 - To practice the computation of line integrals, surface integrals. CO 3 - To find the complementary function and particular integral of a differential equation by using appropriate methods. CO 4 - To use computational tools to solve problems and applications of partial differential equations of first order. CO 5 - To use Laplace transform and their inverse to solve differential equations.

#	Code	Course					PO	PSO	CO
183	MNM202	Non Major Elective Course (NME): Quantitative Aptitude II			☑		PO 1 - To equip students with hands on training through various courses to enhance entrepreneurship skills. PO 3 - To face challenging competitive examinations that offer rewarding careers in science and education. PO 4 - To apply the acquired scientific knowledge to face day to day needs and reflect upon green initiatives to build a sustainable environment.	PSO 1 - To acquire a strong foundation in various branches of mathematics to formulate real life problems into mathematical models. PSO 2 - To apply the mathematical knowledge and skills to develop problem solving skills cultivating logical thinking and face competitive examinations with confidence. PSO 4 - To enhance numerical ability and address problems in interdisciplinary areas which would help in project and field works.	CO 1 - To frame equations and solve problems involving ratios and fractions. CO 2 - To calculate the area and compare the objects on the basis of their size and area. CO 3 - To change the form of the number using lograthim and make tedious and confusing calculations simple. CO 4 - To have sufficient knowledge about the basis of calculation. CO 5 - To study the concept related to time, speed and distance.
184	MC1731	Major Core III: Differential Equations and Vector Calculus	☑				PO 1 - To equip students with hands on training through various courses to enhance entrepreneurship skills. PO 2 - To impart communicative skills and ethical values. PO 3 - To face challenging competitive examinations that offer rewarding careers in science and education. PO 4 - To apply the acquired scientific knowledge to face day to day needs and reflect upon green initiatives to build a sustainable environment.	PSO 1 - To acquire a strong foundation in various branches of mathematics to formulate real life problems into mathematical models. PSO 2 - To apply the mathematical knowledge and skills to develop problem solving skills cultivating logical thinking and face competitive examinations with confidence. PSO 3 - To develop entrepreneurial skills based on ethical values, become empowered and self-dependent in society. PSO 4 - To enhance numerical ability and address problems in interdisciplinary areas which would help in project and field works.	CO 1 - To distinguish linear, nonlinear, ordinary and partial differential equations. CO 2 - To solve linear differential equations with constant and variable coefficients. CO 3 - To explain the basic properties of Laplace Transforms and Inverse Laplace Transforms. CO 4 - To use the Laplace transform to find the solution of linear differential equations. CO 5 - To learn methods of forming and solving partial differential equations. CO 6 - To learn differentiation and integration of vector valued functions. CO 7 - To evaluate line and surface integrals using Green's theorem, Stoke's theorem and Gauss divergence theorem. CO 8 - To apply the concepts to solve problems in physical sciences and engineering.
185	MC1732	Major Core IV: Sequences and Series	☑				PO 1 - To equip students with hands on training through various courses to enhance entrepreneurship skills. PO 3 - To face challenging competitive examinations that offer rewarding careers in science and education. PO 4 - To apply the acquired scientific knowledge to face day to day needs and reflect upon green initiatives to build a sustainable environment.	PSO 1 - To acquire a strong foundation in various branches of mathematics to formulate real life problems into mathematical models. PSO 2 - To apply the mathematical knowledge and skills to develop problem solving skills cultivating logical thinking and face competitive examinations with confidence. PSO 4 - To enhance numerical ability and address problems in interdisciplinary areas which would help in project and field works. PSO 5 - To pursue scientific research and develop new findings with global impact using latest technologies.	CO 1 - To understand the basic concepts of real numbers. CO 2 - To explain and analyse the primary concepts of sequences and series of real numbers. CO 3 - To define convergence and divergence of sequences and series. CO 4 - To calculate the limit points, upper and lower limits of the sequences. CO 5 - To evaluate the convergence of series using different types of tests. CO 6 - To develop the skill of analyzing various sequence and series.
186	MA1731	Allied III: Probability Theory and Distributions	☑				PO 1 - To equip students with hands on training through various courses to enhance entrepreneurship skills. PO 2 - To impart communicative skills and ethical values. PO 3 - To face challenging competitive examinations that offer rewarding careers in science and education. PO 4 - To apply the acquired scientific knowledge to face day to day needs and reflect upon green initiatives to build a sustainable environment.	PSO 1 - To acquire a strong foundation in various branches of mathematics to formulate real life problems into mathematical models. PSO 2 - To apply the mathematical knowledge and skills to develop problem solving skills cultivating logical thinking and face competitive examinations with confidence. PSO 3 - To develop entrepreneurial skills based on ethical values, become empowered and self-dependent in society. PSO 4 - To enhance numerical ability and address problems in interdisciplinary areas which would help in project and field works. PSO 5 - To pursue scientific research and develop new findings with global impact using latest technologies.	CO 1 - To recall the definition of probability and set functions. CO 2 - To differentiate between probability and conditional probability and compute according to the requirement. CO 3 - To understand the definition of random variables, their types and related concepts. CO 4 - To detect the different probability distributions which are widely used. CO 5 - To apply the techniques to prove the properties of probability and related distributions. CO 6 - To choose the suitable probability distribution corresponding to a given data. CO 7 - To test the validity of a given data.
187	MC17S1	Self-Learning Course: Discrete Mathematics I	☑				PO 1 - To apply the acquired scientific knowledge to face day to day needs. PO 5 - To face challenging competitive examinations that offer rewarding careers in science and education.	PSO 1 - To acquire a strong foundation in various branches of mathematics to formulate real life problems into mathematical models. PSO 4 - To apply the mathematical knowledge and skills to face competitive examination with confidence. PSO 5 - To pursue higher studies which in turn will offer them job opportunities in government and public sector undertakings, banks, central government institutes etc.	CO 1 - To learn some important notions of graph theory. CO 2 - To be familiar with the definitions of basic graph theory. CO 3 - To give matrix representation of various graphs. CO 4 - To prove simple results in graph theory. CO 5 - To write algorithms for proven results. CO 6 - To understand the basics of relations and functions. CO 7 - To classify the types of functions and relations. CO 8 - To draw the graphs of given functions. CO 9 - To cite examples of different types of functions. CO 10 - To analyze the difference between a relation and a function.
188	MC1741	Major Core V: Groups and Rings	☑				PO 1 - To equip students with hands on training through various courses to enhance entrepreneurship skills. PO 3 - To face challenging competitive examinations that offer rewarding careers in science and education. PO 4 - To apply the acquired scientific knowledge to face day to day needs and reflect upon green initiatives to build a sustainable environment.	PSO 1 - To acquire a strong foundation in various branches of mathematics to formulate real life problems into mathematical models. PSO 2 - To apply the mathematical knowledge and skills to develop problem solving skills cultivating logical thinking and face competitive examinations with confidence. PSO 4 - To enhance numerical ability and address problems in interdisciplinary areas which would help in project and field works. PSO 5 - To pursue scientific research and develop new findings with global impact using latest technologies.	CO 1 - To recall the definitions of groups, rings, functions and also examples of groups and rings. CO 2 - To explain the properties of groups, rings and different types of groups and rings. CO 3 - To develop proofs of results on Permutation groups, Cyclic groups, Quotient group, Subgroups, Sub rings, Quotient rings. CO 4 - To examine the properties of Ideals-Maximal and Prime ideals-Cosets-order of an element. CO 5 - To test the homomorphic and isomorphic properties of groups and rings. CO 6 - To develop the concepts of ordered integral domains and Unique Factorization Domains. CO 7 - To apply the theory of Groups and Rings and solve problems.

189	MC1742	Major Core VI: Analytical Geometry of 3 Dimensions	☑			PO 1 - To equip students with hands on training through various courses to enhance entrepreneurship skills. PO 2 - To impart communicative skills and ethical values. PO 3 - To face challenging competitive examinations that offer rewarding careers in science and education. PO 4 - To apply the acquired scientific knowledge to face day to day needs and reflect upon green initiatives to build a sustainable environment.	PSO 1 - To acquire a strong foundation in various branches of mathematics to formulate real life problems into mathematical models. PSO 2 - To apply the mathematical knowledge and skills to develop problem solving skills cultivating logical thinking and face competitive examinations with confidence. PSO 3 - To develop entrepreneurial skills based on ethical values, become empowered and self-dependent in society. PSO 4 - To enhance numerical ability and address problems in interdisciplinary areas which would help in project and field works. PSO 5 - To pursue scientific research and develop new findings with global impact using latest technologies.	CO 1 - To recall the basic definitions and concepts of planes and lines. CO 2 - To demonstrate the projection of the line joining two points, cosines of the line joining two points and to solve problems. CO 3 - To calculate the distance between points, planes and the angles between lines and planes. CO 4 - To draw three dimensional surfaces from the given information. CO 5 - To discuss the characteristics and properties of 3-dimensional objects like sphere, cube, cone etc. CO 6 - To develop the skill in 3-dimensional geometry to gain mastery in related courses.
190	MA1741	Allied IV: Applied Statistics	☑			PO 1 - To equip students with hands on training through various courses to enhance entrepreneurship skills. PO 2 - To impart communicative skills and ethical values. PO 3 - To face challenging competitive examinations that offer rewarding careers in science and education. PO 4 - To apply the acquired scientific knowledge to face day to day needs and reflect upon green initiatives to build a sustainable environment.	PSO 1 - To acquire a strong foundation in various branches of mathematics to formulate real life problems into mathematical models. PSO 2 - To apply the mathematical knowledge and skills to develop problem solving skills cultivating logical thinking and face competitive examinations with confidence. PSO 3 - To develop entrepreneurial skills based on ethical values, become empowered and self-dependent in society. PSO 4 - To enhance numerical ability and address problems in interdisciplinary areas which would help in project and field works. PSO 5 - To pursue scientific research and develop new findings with global impact using latest technologies.	CO 1 - To identify and demonstrate appropriate sampling processes. CO 2 - To recall the methods of classifying and analyzing data relative to single variable. CO 3 - To describe the χ^2 distribution in statistics. CO 4 - To distinguish between the practical purposes of a large and a small sample. CO 5 - To understand that correlation coefficient is independent of the change of origin and scale.
191	MC17S2	Self-Learning Course: Discrete Mathematics II	☑			PO 1 - To apply the acquired scientific knowledge to face day to day needs. PO 5 - To face challenging competitive examinations that offer rewarding careers in science and education.	PSO 1 - To acquire a strong foundation in various branches of mathematics to formulate real life problems into mathematical models. PSO 2 - To develop problem solving skills, cultivating logical thinking, and face competitive examinations with confidence. PSO 4 - To apply the mathematical knowledge and skills to face competitive examination with confidence. PSO 5 - To pursue higher studies which in turn will offer them job opportunities in government and public sector undertakings, banks, central government institutes etc.	CO 1 - To interpret mathematical notation and mathematical definitions. CO 2 - To define eigen values and eigen vectors. CO 3 - To develop a historical perspective of modern discrete mathematics. CO 4 - To explain the Basic Boolean Algebra laws. CO 5 - To evaluate discrete mathematics problems that involve computing permutations and combinations of a set. CO 6 - To relate distributive lattice and complimented lattice.
192	MC1751	Major Core VII: Linear Algebra	☑			PO 1 - To apply the acquired scientific knowledge to face day to day needs. PO 3 - To carry out field works and projects independently and in collaboration with other institutions and industries. PO 5 - To face challenging competitive examinations that offer rewarding careers in science and education.	PSO 1 - To acquire a strong foundation in various branches of mathematics to formulate real life problems into mathematical models. PSO 2 - To develop problem solving skills, cultivating logical thinking, and face competitive examinations with confidence. PSO 3 - To enhance numerical ability and address problems in interdisciplinary areas which would help in project and field works.	CO 1 - To recall and define Groups ,Fields and their properties. CO 2 - To cite examples of vector spaces ,subspaces and linear transformations. CO 3 - To determine the concepts of linear independence, linear dependence , basis and dimension of vector spaces. CO 4 - To correlate rank and nullity ,Linear transformation and matrix of a Linear transformation. CO 5 - To examine whether a given space is an inner product space and the orthonormality of sets.
193	MC1752	Major Core VIII: Real Analysis	☑			PO 1 - To apply the acquired scientific knowledge to face day to day needs. PO 3 - To carry out field works and projects independently and in collaboration with other institutions and industries. PO 4 - To reflect upon green initiatives and take responsible steps to build a sustainable environment. PO 5 - To face challenging competitive examinations that offer rewarding careers in science and education. PO 6 - To impart communicative skills and ethical values.	PSO 1 - To acquire a strong foundation in various branches of mathematics to formulate real life problems into mathematical models. PSO 4 - To apply the mathematical knowledge and skills to face competitive examination with confidence. PSO 7 - To understand the professional, ethical, legal, security, social issues and responsibilities. PSO 8 - To apply knowledge of principles, concepts and results in specific subject area to analyze their local and global impact. PSO 9 - To communicate appropriately and effectively, in a scientific context using present technology and new findings.	CO 1 - To understand the concepts of completeness, continuity and discontinuity of metric spaces. CO 2 - To apply the metric space theorems to real life situations. CO 3 - To distinguish between continuous functions and uniform continuous functions. CO 4 - To use basic concepts in the development of real analysis results. CO 5 - To understand the concepts of countable sets, metric space, connectedness, compactness of metric spaces. CO 6 - To develop the ability to reflect on problems that are quite significant in the field of real analysis.
194	MC1753	Major Core IX: Graph Theory	☑			PO 1 - To apply the acquired scientific knowledge to face day to day needs. PO 3 - To carry out field works and projects independently and in collaboration with other institutions and industries. PO 5 - To face challenging competitive examinations that offer rewarding careers in science and education.	PSO 1 - To acquire a strong foundation in various branches of mathematics to formulate real life problems into mathematical models. PSO 2 - To develop problem solving skills, cultivating logical thinking, and face competitive examinations with confidence. PSO 3 - To enhance numerical ability and address problems in interdisciplinary areas which would help in project and field works. PSO 4 - To apply the mathematical knowledge and skills to face competitive examination with confidence.	CO 1 - To understand the basic definitions to write the proofs of simple theorems. CO 2 - To employ the definitions to write the proofs of simple theorems. CO 3 - To relate real life situations with mathematical graphs. CO 4 - To develop the ability to solve problems in graph theory. CO 5 - To analyze real life problems using graph theory both quantitatively and qualitatively.

#	Code	Title					PO	PSO	CO
195	MC1754	Major: Project	☑	☑	☑	☑	PO 1 - To apply the acquired scientific knowledge to face day to day needs. PO 3 - To carry out field works and projects independently and in collaboration with other institutions and industries. PO 5 - To face challenging competitive examinations that offer rewarding careers in science and education.	PSO 1 - To acquire a strong foundation in various branches of mathematics to formulate real life problems into mathematical models. PSO 3 - To enhance numerical ability and address problems in interdisciplinary areas which would help in project and field works. PSO 4 - To apply the mathematical knowledge and skills to face competitive examination with confidence. PSO 5 - To pursue higher studies which in turn will offer them job opportunities in government and public sector undertakings, banks, central government institutes etc.	CO 1 - To choose a new topic of their interest. CO 2 - To develop the attitude of studying a topic in depth independently. CO 3 - To express their views with confidence in a group. CO 4 - To relate with the group members and reap the best harvest. CO 5 - To develop communication skills through oral presentation. CO 6 - To create a taste for research in mathematics. CO 7 - To develop confidence to face interviews. CO 8 - To interpret and analyze data mathematically.
196	MC1755	Elective I: a) Numerical Methods		☑			PO 1 - To apply the acquired scientific knowledge to face day to day needs. PO 3 - To carry out field works and projects independently and in collaboration with other institutions and industries. PO 5 - To face challenging competitive examinations that offer rewarding careers in science and education.	PSO 1 - To acquire a strong foundation in various branches of mathematics to formulate real life problems into mathematical models. PSO 2 - To develop problem solving skills, cultivating logical thinking, and face competitive examinations with confidence. PSO 3 - To enhance numerical ability and address problems in interdisciplinary areas which would help in project and field works. PSO 4 - To apply the mathematical knowledge and skills to face competitive examination with confidence.	CO 1 - To understand the basic definitions and meaning of interpolation. CO 2 - To select appropriate numerical methods and apply the same to various types of problems. CO 3 - To apply numerical methods to obtain approximate solutions to mathematical problems. CO 4 - To employ different methods of constructing a polynomial using various methods. CO 5 - To compare the rate of convergence of different numerical formula. CO 6 - To distinguish the advantages and disadvantages of various numerical methods.
197	MC1756	Elective I: b) Fuzzy Mathematics		☑		☑	PO 1 - To apply the acquired scientific knowledge to face day to day needs. PO 3 - To carry out field works and projects independently and in collaboration with other institutions and industries. PO 5 - To face challenging competitive examinations that offer rewarding careers in science and education.	PSO 1 - To acquire a strong foundation in various branches of mathematics to formulate real life problems into mathematical models. PSO 2 - To develop problem solving skills, cultivating logical thinking, and face competitive examinations with confidence. PSO 3 - To enhance numerical ability and address problems in interdisciplinary areas which would help in project and field works. PSO 4 - To apply the mathematical knowledge and skills to face competitive examination with confidence.	CO 1 - To understand the basic mathematical operations carried out on fuzzy sets. CO 2 - To compare fuzzy sets with crisp sets. CO 3 - To explain classical logic and fuzzy logic. CO 4 - To describe the significance of fuzzy systems and genetic algorithms. CO 5 - To solve problems that are appropriately solved by neural networks , fuzzy logic and genetic algorithms. CO 6 - To apply the concepts fuzzy systems and neural networks in various fields like machine intelligence and robotics. CO 7 - To differentiate between Possibility theory and Probability theory.
198	MC1757	Elective I: c) Object Oriented Programming with C++				☑	PO 1 - To apply the acquired scientific knowledge to face day to day needs. PO 3 - To carry out field works and projects independently and in collaboration with other institutions and industries. PO 5 - To face challenging competitive examinations that offer rewarding careers in science and education.	PSO 1 - To acquire a strong foundation in various branches of mathematics to formulate real life problems into mathematical models. PSO 2 - To develop problem solving skills, cultivating logical thinking, and face competitive examinations with confidence. PSO 3 - To enhance numerical ability and address problems in interdisciplinary areas which would help in project and field works. PSO 4 - To apply the mathematical knowledge and skills to face competitive examination with confidence. PSO 5 - To pursue higher studies which in turn will offer them job opportunities in government and public sector undertakings, banks, central government institutes etc.	CO 1 - To apply C++ features to program design and implementation. CO 2 - To explain object oriented concepts and describe how they are supported by C++. CO 3 - To use C++ to demonstrate practical experience in developing object oriented solutions. CO 4 - To design and implement programs using C++. CO 5 - To analyze a problem description and design object oriented software using good coding practices and techniques. CO 6 - To implement an achievable practical applications and analyze issues related to object oriented techniques in the C++ programming language. CO 7 - To use common software patterns in object oriented design and recognize their applicability to other software development contexts. CO 8 - To create application using C++ programming language. CO 9 - To write algorithm for programs
199	MSK175	Skill Based Course: Mathematics for Competitive Examination - I				☑	PO 1 - To apply the acquired scientific knowledge to face day to day needs. PO 3 - To carry out field works and projects independently and in collaboration with other institutions and industries. PO 5 - To face challenging competitive examinations that offer rewarding careers in science and education.	PSO 1 - To acquire a strong foundation in various branches of mathematics to formulate real life problems into mathematical models. PSO 2 - To develop problem solving skills, cultivating logical thinking, and face competitive examinations with confidence. PSO 3 - To enhance numerical ability and address problems in interdisciplinary areas which would help in project and field works. PSO 4 - To apply the mathematical knowledge and skills to face competitive examination with confidence. PSO 5 - To pursue higher studies which in turn will offer them job opportunities in government and public sector undertakings, banks, central government institutes etc.	CO 1 - To recall the problems on percentage. CO 2 - To discuss the problems on population and depreciation. CO 3 - To conversion of decimal into percentage and vice versa. CO 4 - To use percentage concept to solve applied technical problems. CO 5 - To analyze the problems related to inlet and outlet of the tank. CO 6 - To evaluate time and distance related problems. CO 7 - To create the ability to make an appropriate mixture.

					PO	PSO	CO
200	MC1761	Major Core X: Complex Analysis	☑		PO 1 - To apply the acquired scientific knowledge to face day to day needs. PO 3 - To carry out field works and projects independently and in collaboration with other institutions and industries. PO 5 - To face challenging competitive examinations that offer rewarding careers in science and education.	PSO 1 - To acquire a strong foundation in various branches of mathematics to formulate real life problems into mathematical models. PSO 3 - To enhance numerical ability and address problems in interdisciplinary areas which would help in project and field works. PSO 4 - To apply the mathematical knowledge and skills to face competitive examination with confidence. PSO 8 - To apply knowledge of principles, concepts and results in specific subject area to analyze their local and global impact.	CO 1 - To understand the geometric representation of complex numbers. CO 2 - To use differentiation rules to compute derivatives and express complex-differentiable functions as power series. CO 3 - To compute line integrals by using Cauchy's integral theorem and formula. CO 4 - To identify the isolated singularities of a function and determine whether they are removable, poles or essential. CO 5 - To evaluate definite integrals by using residues theorem.
201	MC1762	Major Core XI: Mechanics	☑		PO 1 - To apply the acquired scientific knowledge to face day to day needs. PO 4 - To reflect upon green initiatives and take responsible steps to build a sustainable environment. PO 5 - To face challenging competitive examinations that offer rewarding careers in science and education. PO 7 - To equip students with hands on training through various courses to enhance entrepreneurship skills.	PSO 1 - To acquire a strong foundation in various branches of mathematics to formulate real life problems into mathematical models. PSO 2 - To develop problem solving skills, cultivating logical thinking, and face competitive examinations with confidence. PSO 4 - To apply the mathematical knowledge and skills to face competitive examination with confidence. PSO 6 - To develop entrepreneurial skills, become empowered and self-dependent in society. PSO 7 - To understand the professional, ethical, legal, security, social issues and responsibilities.	CO 1 - To calculate the reactions necessary to ensure static equilibrium. CO 2 - To apply the principles of static equilibrium to particles and rigid bodies. CO 3 - To understand the ways of distributing loads. CO 4 - To identify internal forces and moments of a rigid body. CO 5 - To apply the basic principles of projectiles into real world problems. CO 6 - To classify the laws of friction. CO 7 - To describe energy methods for particles and systems of particles. CO 8 - To understand the general principles of dynamics. CO 9 - To differentiate the various frictional forces.
202	MC1763	Major Core XII: Number Theory	☑		PO 1 - To apply the acquired scientific knowledge to face day to day needs. PO 3 - To carry out field works and projects independently and in collaboration with other institutions and industries.	PSO 1 - To acquire a strong foundation in various branches of mathematics to formulate real life problems into mathematical models. PSO 2 - To develop problem solving skills, cultivating logical thinking, and face competitive examinations with confidence. PSO 3 - To enhance numerical ability and address problems in interdisciplinary areas which would help in project and field works. PSO 5 - To pursue higher studies which in turn will offer them job opportunities in government and public sector undertakings, banks, central government institutes etc. PSO 6 - To develop entrepreneurial skills, become empowered and self-dependent in society. PSO 7 - To understand the professional, ethical, legal, security, social issues and responsibilities. PSO 8 - To apply knowledge of principles, concepts and results in specific subject area to analyze their local and global impact.	CO 1 - To express the concepts and results of divisibility of integers effectively. CO 2 - To construct mathematical proofs of theorems and find counter examples for false statements. CO 3 - To collect and use numerical data to form conjectures about the integers. CO 4 - To understand the logic and methods behind the major proofs in Number Theory. CO 5 - To solve challenging problems related to Chinese remainder theorem effectively. CO 6 - To build up the basic theory of the integers from a list of axioms. CO 7 - To explore some current research problems in number theory. CO 8 - To apply Fermat's theorem and Wilsons theorem effectively. CO 9 - To use mathematical induction and other types of proof writing techniques CO 10 - To understand and utilize mathematical functions and empirical principles and processes
203	MC1764	Major Core XIII: Operations Research	☑		PO 1 - To apply the acquired scientific knowledge to face day to day needs. PO 3 - To carry out field works and projects independently and in collaboration with other institutions and industries. PO 5 - To face challenging competitive examinations that offer rewarding careers in science and education.	PSO 1 - To acquire a strong foundation in various branches of mathematics to formulate real life problems into mathematical models. PSO 3 - To enhance numerical ability and address problems in interdisciplinary areas which would help in project and field works. PSO 4 - To apply the mathematical knowledge and skills to face competitive examination with confidence.	CO 1 - To understand the origin and development of Operations Research. CO 2 - To explain what is an LPP. CO 3 - To define how to formulate an LPP with linear constraints. CO 4 - To maximize the profit, minimize the cost, minimize the time in transportation problem , Travelling salesman problem, Assignment problem. CO 5 - To identify a problem in your locality, formulate it as an LPP and solve.
204	MC1765	Elective II: a) Astronomy		☑	PO 1 - To apply the acquired scientific knowledge to face day to day needs. PO 5 - To face challenging competitive examinations that offer rewarding careers in science and education.	PSO 1 - To acquire a strong foundation in various branches of mathematics to formulate real life problems into mathematical models. PSO 2 - To develop problem solving skills, cultivating logical thinking, and face competitive examinations with confidence. PSO 4 - To apply the mathematical knowledge and skills to face competitive examination with confidence.	CO 1 - To define the spherical trigonometry of the celestial sphere. CO 2 - To discuss the Kepler's laws. CO 3 - To calculate the maximum and minimum number of eclipses near a node in a year. CO 4 - To interpret latitude and longitude and apply this to find the latitude and longitude of a particular place. CO 5 - To distinguish between geometric parallax and horizontal parallax.
205	MC1766	Elective II: b) Boolean Algebra	☑		PO 1 - To apply the acquired scientific knowledge to face day to day needs. PO 5 - To face challenging competitive examinations that offer rewarding careers in science and education.	PSO 1 - To acquire a strong foundation in various branches of mathematics to formulate real life problems into mathematical models.. PSO 2 - To develop problem solving skills, cultivating logical thinking, and face competitive examinations with confidence. PSO 5 - To pursue higher studies which in turn will offer them job opportunities in government and public sector undertakings, banks, central government institutes etc.	CO 1 - To discuss the primary concepts of Lattices and Boolean algebra. CO 2 - To recognize upper bound, lower bound, greatest lower bound. CO 3 - To differentiate between lattices and complete lattices. CO 4 - To relate the concepts of lattice homomorphism and isomorphism. CO 5 - To formulate problems in Lattices and Boolean Algebra.

No.	Code	Course					PO	PSO	CO
206	MC1767	Elective II: c) Web Designing with HTML	☑				PO 1 - To apply the acquired scientific knowledge to face day to day needs. PO 5 - To face challenging competitive examinations that offer rewarding careers in science and education.	PSO 1 - To acquire a strong foundation in various branches of mathematics to formulate real life problems into mathematical models. PSO 2 - To develop problem solving skills, cultivating logical thinking, and face competitive examinations with confidence. PSO 4 - To apply the mathematical knowledge and skills to face competitive examination with confidence.	CO 1 - To define modern protocols and systems used on the web(such as HTML,HTTP). CO 2 - To employ fundamental knowledge on web designing with makeup language. CO 3 - To gain strong knowledge in HTML. CO 4 - To use critical thinking skills to design and implement an interactive websites with regard to issues of usability, accessibility and internationalism. CO 5 - To pursue future courses in website development and design.
207	MSK176	Skill Based Course: Mathematics for Competitive Examination - II		☑			PO 1 - To apply the acquired scientific knowledge to face day to day needs. PO 5 - To face challenging competitive examinations that offer rewarding careers in science and education.	PSO 1 - To acquire a strong foundation in various branches of mathematics to formulate real life problems into mathematical models. PSO 2 - To develop problem solving skills, cultivating logical thinking, and face competitive examinations with confidence. PSO 4 - To apply the mathematical knowledge and skills to face competitive examination with confidence. PSO 5 - To pursue higher studies which in turn will offer them job opportunities in government and public sector undertakings, banks, central government institutes etc.	CO 1 - To recognize the difference between volume and surface areas. CO 2 - To demonstrate the basic concepts of Compound interest. CO 3 - To apply analytical techniques to solve stocks and shares problems. CO 4 - To calculate time taken by the train to pass a pole and similar problems. CO 5 - To compare the surface areas of cuboid and cube. CO 6 - To evaluate the volume of cylinder. CO 7 - To measure the surface area of the sphere. CO 8 - To examine the face value and market value.
208	PM2011	Core I: Algebra I			☑		PO 1 - To prepare successful professionals in industry, government, academia, research, entrepreneurial pursuits and consulting firms. PO 2 - To face and succeed in high level competitive examinations like NET, GATE and TOFEL. PO 3 - To carry out internship programmes and research projects to develop scientific skills and innovative ideas. PO 4 - To utilize the obtained scientific knowledge to create eco-friendly environment.	PSO 1 - To utilize the knowledge gained for entrepreneurial pursuits. PSO 2 - To sharpen their analytical thinking, logical deductions and rigour in reasoning. PSO 3 - To use the techniques, skills and modern technology necessary to communicate effectively with professional and ethical responsibilities. PSO 4 - To understand the applications of mathematics in a global economic environmental and social context.	CO 1 - To understand the fundamental concepts of abstract algebra and give illustrations. CO 2 - To analyze and demonstrate examples of various Sylow p- subgroups, automorphisms, conjugate classes, finite abelian groups, characteristic subgroups, rings, ideals, Euclidean domain, Factorization domain. CO 3 - To develop proofs for Sylow's theorems, finite abelian groups, direct products, Cauchy's theorem, Cayley's Theorem, automorphisms for groups. CO 4 - To develop the way of embedding of rings and design proofs for theorems related to rings, polynomial rings, Division Algorithm, Gauss' lemma and Eisenstein Criterion. CO 5 - To apply the concepts of Cayley's theorem, Counting principles, Sylow's theorems, Rings and Ideals in the structure of certain groups of small order. CO 6 - To compare Euclidean domain and Unique factorization domain, Polynomial Rings, Polynomial Rings over Commutative Rings and various concepts in Abstract Algebra.
209	PM2012	Core II: Analysis I			☑		PO 1 - To prepare successful professionals in industry, government, academia, research, entrepreneurial pursuits and consulting firms. PO 2 - To face and succeed in high level competitive examinations like NET, GATE and TOFEL. PO 3 - To carry out internship programmes and research projects to develop scientific skills and innovative ideas. PO 4 - To utilize the obtained scientific knowledge to create eco-friendly environment.	PSO 1 - To utilize the knowledge gained for entrepreneurial pursuits. PSO 2 - To sharpen their analytical thinking, logical deductions and rigour in reasoning. PSO 3 - To use the techniques, skills and modern technology necessary to communicate effectively with professional and ethical responsibilities. PSO 4 - To understand the applications of mathematics in a global economic environmental and social context.	CO 1 - To explain the fundamental concepts of analysis and their role in modern mathematics. CO 2 - To deal with various examples of metric space, compact sets and completeness in Euclidean space. CO 3 - To utilize the techniques for testing the convergence of sequence and series. CO 4 - To understand the important theorems such as Intermediate valued theorem, Mean value theorem, Roll's theorem, Taylor and L'Hospital theorem. CO 5 - To apply the concepts of differentiation in problems.
210	PM2013	Core III: Probability and Statistics			☑		PO 1 - To prepare successful professionals in industry, government, academia, research, entrepreneurial pursuits and consulting firms. PO 2 - To face and succeed in high level competitive examinations like NET, GATE and TOFEL. PO 3 - To carry out internship programmes and research projects to develop scientific skills and innovative ideas. PO 4 - To utilize the obtained scientific knowledge to create eco-friendly environment.	PSO 1 - To utilize the knowledge gained for entrepreneurial pursuits. PSO 2 - To sharpen their analytical thinking, logical deductions and rigour in reasoning. PSO 3 - To use the techniques, skills and modern technology necessary to communicate effectively with professional and ethical responsibilities. PSO 4 - To understand the applications of mathematics in a global economic environmental and social context.	CO 1 - To recall the basic probability axioms,conditional probability, random variables and related concepts. CO 2 - To compute marginal and conditional distributions and check the stochastic independence. CO 3 - To recall Binomial, Poisson and Normal distributions and learn new distributions such as multinomial, Chi square and Bivariate normal distributions. CO 4 - To learn the transformation technique for finding the p.d.f of functions of random variables and use these techniques to solve related problems. CO 5 - To employ the relevant concepts of analysis to determine limiting distributions of random variables. CO 6 - To learn Estimation, Point estimation and Confidence Intervals for Means, difference of means and variances. CO 7 - To design probability models to deal with real world problems and solve problems involving probabilistic situations

						PO	PSO	CO
211	PM2014	Core IV: Ordinary Differential Equations			☑	PO 1 - To prepare successful professionals in industry, government, academia, research, entrepreneurial pursuits and consulting firms. PO 2 - To face and succeed in high level competitive examinations like NET, GATE and TOFEL. PO 3 - To carry out internship programmes and research projects to develop scientific skills and innovative ideas. PO 4 - To utilize the obtained scientific knowledge to create eco-friendly environment.	PSO 1 - To utilize the knowledge gained for entrepreneurial pursuits. PSO 2 - To sharpen their analytical thinking, logical deductions and rigour in reasoning. PSO 3 - To use the techniques, skills and modern technology necessary to communicate effectively with professional and ethical responsibilities. PSO 4 - To understand the applications of mathematics in a global economic environmental and social context.	CO 1 - To recall the definitions of degree and order of differential equations and determine whether a system of functions is linearly independent using the Wronskian definition. CO 2 - To solve linear ordinary differential equations with constant coefficients by using power series expansion. CO 3 - To determine the solutions for a linear system of first order equations. CO 4 - To learn properties of Legendre polynomials and Properties of Bessel Functions. CO 5 - To analyze the concepts of existence and uniqueness of solutions of the ordinary differential equations. CO 6 - To create differential equations for a large number of real world problems.
212	PM2015	Elective I: a) Numerical Analysis			☑	PO 1 - To prepare successful professionals in industry, government, academia, research, entrepreneurial pursuits and consulting firms. PO 2 - To face and succeed in high level competitive examinations like NET, GATE and TOFEL. PO 3 - To carry out internship programmes and research projects to develop scientific skills and innovative ideas. PO 4 - To utilize the obtained scientific knowledge to create eco-friendly environment.	PSO 1 - To utilize the knowledge gained for entrepreneurial pursuits. PSO 2 - To sharpen their analytical thinking, logical deductions and rigour in reasoning. PSO 3 - To use the techniques, skills and modern technology necessary to communicate effectively with professional and ethical responsibilities. PSO 4 - To understand the applications of mathematics in a global economic environmental and social context.	CO 1 - To recall the methods of finding the roots of the algebraic and transcendental equations. CO 2 - To understand the significance of the finite, forward, backward and central differences and their properties. CO 3 - To learn the procedures of fitting straight lines and curves. CO 4 - To compute the solutions of a system of equations by using appropriate numerical methods. CO 5 - To solve the problems in ODE by using Taylor's series method, Euler's method etc.
213	PM2016	Elective I: a) Fuzzy Sets and Fuzzy Logic			☑	PO 1 - To prepare successful professionals in industry, government, academia, research, entrepreneurial pursuits and consulting firms. PO 2 - To face and succeed in high level competitive examinations like NET, GATE and TOFEL. PO 3 - To carry out internship programmes and research projects to develop scientific skills and innovative ideas. PO 4 - To utilize the obtained scientific knowledge to create eco-friendly environment.	PSO 1 - To utilize the knowledge gained for entrepreneurial pursuits. PSO 2 - To sharpen their analytical thinking, logical deductions and rigour in reasoning. PSO 3 - To use the techniques, skills and modern technology necessary to communicate effectively with professional and ethical responsibilities. PSO 4 - To understand the applications of mathematics in a global economic environmental and social context.	CO 1 - To define and explain the fundamental concepts of fuzzy set theory, including membership functions, fuzzy set operations (union, intersection, complement), and the extension principle. CO 2 - To identify and analyze real-world problems where fuzzy logic can be applied effectively. CO 3 - To design fuzzy logic systems for specific applications, such as fuzzy controllers for industrial processes or fuzzy decision-making systems. CO 4 - To understand the components of a fuzzy inference system and implementing rule-based fuzzy systems for various applications. CO 5 - To understand how to use fuzzy logic to control variables in dynamic systems, such as temperature control in HVAC systems or speed control in robotics. CO 6 - To be familiar with software tools and programming languages commonly used for implementing fuzzy logic systems, such as MATLAB. CO 7 - To use these tools to simulate and solve fuzzy logic problems.
214	PM2021	Core V: Modules and Vector Spaces			☑	PO 1 - To prepare successful professionals in industry, government, academia, research, entrepreneurial pursuits and consulting firms. PO 2 - To face and succeed in high level competitive examinations like NET, GATE and TOFEL. PO 3 - To carry out internship programmes and research projects to develop scientific skills and innovative ideas. PO 4 - To utilize the obtained scientific knowledge to create eco-friendly environment.	PSO 1 - To utilize the knowledge gained for entrepreneurial pursuits. PSO 2 - To sharpen their analytical thinking, logical deductions and rigour in reasoning. PSO 3 - To use the techniques, skills and modern technology necessary to communicate effectively with professional and ethical responsibilities. PSO 4 - To understand the applications of mathematics in a global economic environmental and social context.	CO 1 - To recall the definitions and properties of Vector Spaces and Subspaces. CO 2 - To analyze the concepts Linear Independence, Dependence and Basis. CO 3 - To apply the definition and properties of Linear transformation and Matrices of Linear transformation. CO 4 - To gain knowledge about characteristic polynomial, eigen vectors, eigen values and eigen spaces as well as the geometric and the algebraic multiplicities of an eigen value. CO 5 - To learn and apply Jordan form and triangular form for computations.
215	PM2022	Core VI: Analysis II			☑	PO 1 - To prepare successful professionals in industry, government, academia, research, entrepreneurial pursuits and consulting firms. PO 2 - To face and succeed in high level competitive examinations like NET, GATE and TOFEL. PO 3 - To carry out internship programmes and research projects to develop scientific skills and innovative ideas. PO 4 - To utilize the obtained scientific knowledge to create eco-friendly environment.	PSO 1 - To utilize the knowledge gained for entrepreneurial pursuits. PSO 2 - To sharpen their analytical thinking, logical deductions and rigour in reasoning. PSO 3 - To use the techniques, skills and modern technology necessary to communicate effectively with professional and ethical responsibilities. PSO 4 - To understand the applications of mathematics in a global economic environmental and social context.	CO 1 - To recall the definition of continuity, boundedness and some results on uniform convergence. CO 2 - To recognise the difference between pointwise and uniform convergence of a sequence of functions and Riemann Stieltjes integrals. CO 3 - To understand the close relation between equicontinuity and uniform convergence of sequence of continuous function and rectifiable curves. CO 4 - To learn Parseval's theorem, Stone Weierstrass theorem and know about its physical significance in terms of the power of the Fourier components. CO 5 - To utilize the definition of differentiation and partial derivative of function of several variables to solve problems. CO 6 - To interpret the concept of the contraction principle and the inverse function theorem.

216	PM2023	Core VII: Partial Differential Equations			☑	PO 1 - To prepare successful professionals in industry, government, academia, research, entrepreneurial pursuits and consulting firms. PO 2 - To face and succeed in high level competitive examinations like NET, GATE and TOFEL. PO 3 - To carry out internship programmes and research projects to develop scientific skills and innovative ideas. PO 4 - To utilize the obtained scientific knowledge to create eco-friendly environment.	PSO 1 - To utilize the knowledge gained for entrepreneurial pursuits. PSO 2 - To sharpen their analytical thinking, logical deductions and rigour in reasoning. PSO 3 - To use the techniques, skills and modern technology necessary to communicate effectively with professional and ethical responsibilities. PSO 4 - To understand the applications of mathematics in a global economic environmental and social context.	CO 1 - To recall the definitions of complete integral, particular integral and singular integrals. CO 2 - To learn some methods to solve the problems of non-linear first order partial differential equations. homogeneous and non homogeneous linear partial differential equations with constant coefficients and solve related problems. CO 3 - To analyze the classification of partial differential equations in three independent variables – cauchy's problem for a second order partial differential equations. CO 4 - To solve the boundary value problem for the heat equations and the wave equation. CO 5 - To apply the concepts and methods in physical processes like heat transfer and electrostatics.
217	PM2024	Core VIII: Graph Theory			☑	PO 1 - To prepare successful professionals in industry, government, academia, research, entrepreneurial pursuits and consulting firms. PO 2 - To face and succeed in high level competitive examinations like NET, GATE and TOFEL. PO 3 - To carry out internship programmes and research projects to develop scientific skills and innovative ideas. PO 4 - To utilize the obtained scientific knowledge to create eco-friendly environment.	PSO 1 - To utilize the knowledge gained for entrepreneurial pursuits. PSO 2 - To sharpen their analytical thinking, logical deductions and rigour in reasoning. PSO 3 - To use the techniques, skills and modern technology necessary to communicate effectively with professional and ethical responsibilities. PSO 4 - To understand the applications of mathematics in a global economic environmental and social context. .	CO 1 - To identify cut vertices and understand various versions of connectedness of a graph. CO 2 - To understand the concept of Digraphs and characterize Eulerian Digraphs. CO 3 - To recall the definitions of Matchings and design proof for characterization of graphs containing a 1-factor. CO 4 - To solve problems involving coloring and learn necessary conditions for planar graphs. CO 5 - To learn the basic definitions of domination and review the concept of distance in a graph.
218	PM2025	Elective II: a) Classical Dynamics			☑	PO 1 - To prepare successful professionals in industry, government, academia, research, entrepreneurial pursuits and consulting firms. PO 2 - To face and succeed in high level competitive examinations like NET, GATE and TOFEL. PO 4 - To utilize the obtained scientific knowledge to create eco-friendly environment.	PSO 1 - To utilize the knowledge gained for entrepreneurial pursuits. PSO 2 - To sharpen their analytical thinking, logical deductions and rigour in reasoning. PSO 4 - To understand the applications of mathematics in a global economic environmental and social context.	CO 1 - To recall the concepts of Newton's laws of motion, momentum, acceleration, motion of a particle. CO 2 - To understand the generalized co-ordinates of the Mechanical system. CO 3 - To apply D'Alembert's Principle to solve the problems involving system of particles. CO 4 - To solve the Newton's equations for simple configuration using various methods. CO 5 - To transform the Lagrangian equations to Hamiltonian equations. CO 6 - To define the canonical transformations and Lagrange and Poisson brackets. CO 7 - To evaluate the system of particles by deriving the Jacobi equation and Jacobi's theorem. CO 8 - To understand the foundation of Hamilton's Principle and differential forms.
219	PM2026	Elective II: b) Differential Geometry			☑	PO 1 - To prepare successful professionals in industry, government, academia, research, entrepreneurial pursuits and consulting firms. PO 2 - To face and succeed in high level competitive examinations like NET, GATE and TOFEL. PO 3 - To carry out internship programmes and research projects to develop scientific skills and innovative ideas. PO 4 - To utilize the obtained scientific knowledge to create eco-friendly environment.	PSO 1 - To utilize the knowledge gained for entrepreneurial pursuits. PSO 2 - To sharpen their analytical thinking, logical deductions and rigour in reasoning. PSO 3 - To use the techniques, skills and modern technology necessary to communicate effectively with professional and ethical responsibilities. PSO 4 - To understand the applications of mathematics in a global economic environmental and social context.	CO 1 - To describe and analyze curves and surfaces in three-dimensional space, including their shapes, curvature, and parametric representations. CO 2 - To compute tangent vectors and normal curvature at any point on a curve or surface, enabling you to understand how objects bend and twist. CO 3 - To analyze and compute these important geometric concepts. CO 4 - To gain proficiency in Riemannian metrics, which are used to measure distances and angles on curved surfaces. CO 5 - To apply the principles of differential geometry to solve practical problems in fields such as computer graphics, robotics, and general relativity, enhancing your problem-solving skills.
220	PM1731	Core IX: Algebra III			☑	PO 2 - To relate the theory and practical knowledge to solve the problems of the society. PO 4 - To face and succeed in high level competitive examinations like NET, GATE and TOFEL. PO 5 - To carry out internship programmes and research projects to develop scientific skills and innovative ideas. PO 6 - To utilize the obtained scientific knowledge to create eco-friendly environment. PO 7 - To prepare expressive, ethical and responsible citizens with proven expertise .	PSO 1 - To have a strong base in theoretical and applied mathematics. PSO 2 - To sharpen their analytical thinking, logical deductions and rigor in reasoning. PSO 3 - To understand the tools required to quantitatively analyze data and have the ability to access and communicate mathematical information. PSO 7 - To understand the applications of mathematics in a global, economic, environmental, and societal context. PSO 8 - To use the techniques, skills and modern technology necessary to communicate effectively with professional and ethical responsibility. PSO 9 - To develop proficiency in analyzing, applying and solving scientific problems.	CO 1 - To recall the definitions and basic concepts of field theory and lattice theory. CO 2 - To express the fundamental concepts of field theory, Galois theory and theory of modules. CO 3 - To demonstrate the use of Galois theory to construct Galois group over the rationals and modules. CO 4 - To distinguish between free modules , quotient modules and simple modules. CO 5 - To interpret distributivity and modularity and apply these concepts in Boolean Algebra. CO 6 - To understand the theory of Frobenius Theorem ,four square theorem and Integral Quaternions. CO 7 - To develop the knowledge of lattices and establish new relationships in Boolean Algebra.

No.	Code	Course					PO	PSO	CO
221	PM1732	Core X: Topology				☑	PO 2 - To relate the theory and practical knowledge to solve the problems of the society. PO 3 - To prepare successful professionals in industry, government, academia, research, entrepreneurial pursuits and consulting firms. PO 4 - To face and succeed in high level competitive examinations like NET, GATE and TOFEL. PO 7 - To prepare expressive, ethical and responsible citizens with proven expertise.	PSO 1 - To have a strong base in theoretical and applied mathematics. PSO 2 - To sharpen their analytical thinking, logical deductions and rigor in reasoning. PSO 3 - To understand the tools required to quantitatively analyze data and have the ability to access and communicate mathematical information. PSO 5 - To acquire knowledge in recent developments in various branches of mathematics and participate in conferences / seminars / workshops and thus pursue research.	CO 1 - To understand the definitions of topological space, closed sets, limit points, continuity, connectedness, compactness, separation axioms and countability axioms. CO 2 - To construct a topology on a set so as to make it into a topological space. CO 3 - To distinguish the various topologies such as product and box topologies and topological spaces such as normal and regular spaces. CO 4 - To compare the concepts of components and path components, connectedness and local connectedness and countability axioms. CO 5 - To apply the various theorems related to regular space, normal space, Hausdorff space, compact space to other branches of mathematics. CO 6 - To construct continuous functions, homeomorphisms and projection mappings.
222	PM1733	Core XI: Measure Theory and Integration				☑	PO 2 - To relate the theory and practical knowledge to solve the problems of the society. PO 3 - To prepare successful professionals in industry, government, academia, research, entrepreneurial pursuits and consulting firms. PO 5 - To carry out internship programmes and research projects to develop scientific skills and innovative ideas. PO 7 - To prepare citizens with proven expertise.	PSO 1 - To have a strong base in theoretical and applied mathematics. PSO 3 - To understand the tools required to quantitatively analyze data and have the ability to access and communicate mathematical information. PSO 5 - To acquire knowledge in recent developments in various branches of mathematics and participate in conferences / seminars / workshops and thus pursue research. PSO 8 - To use the techniques, skills and modern technology necessary to communicate effectively with professional and ethical responsibility. PSO 9 - To develop proficiency in analyzing, applying and solving scientific problems.	CO 1 - To define the concept of measures and Vitali covering and recall some properties of convergence of functions. CO 2 - To cite examples of measurable sets , measurable functions, Riemann integrals, Lebesgue integrals. CO 3 - To apply measures and Lebesgue integrals to various measurable sets and measurable functions. CO 4 - To apply outer measure, differentiation and integration to intervals , functions and sets. CO 5 - To compare the different types of measures and Signed measures. CO 6 - To construct Lp spaces and outer measurable sets.
223	PM1734	Elective III: a) Algebraic Number Theory				☑	PO 2 - To relate the theory and practical knowledge to solve the problems of the society. PO 3 - To prepare successful professionals in industry, government, academia, research, entrepreneurial pursuits and consulting firms. PO 4 - To face and succeed in high level competitive examinations like NET, GATE and TOFEL. PO 6 - To utilize the obtained scientific knowledge to create eco-friendly environment. PO 7 - To prepare expressive, ethical and responsible citizens with proven expertise.	PSO 1 - To have a strong base in theoretical and applied mathematics. PSO 2 - To sharpen their analytical thinking, logical deductions and rigor in reasoning. PSO 3 - To understand the tools required to quantitatively analyze data and have the ability to access and communicate mathematical information. PSO 6 - To utilise the knowledge gained for entrepreneurial pursuits. PSO 7 - To understand the applications of mathematics in a global, economic, environmental, and societal context. PSO 8 - To use the techniques, skills and modern technology necessary to communicate effectively with professional and ethical responsibility.	CO 1 - To recall the basic results of field theory. CO 2 - To understand quadratic and power series forms and Jacobi symbol. CO 3 - To apply binary quadratic forms for the decomposition of a number into sum of sequences. CO 4 - To determine solutions of Diophantine equations. CO 5 - To detect units and primes in quadratic fields. CO 6 - To calculate the possible partitions of a given number and draw Ferrer's graph. CO 7 - To identify formal power series and compare Euler's identity and Euler's formula.
224	PM1735	Elective III: b) Stochastic Process				☑	PO 2 - To relate the theory and practical knowledge to solve the problems of the society. PO 4 - To face and succeed in high level competitive examinations like NET, GATE and TOFEL. PO 6 - To utilize the obtained scientific knowledge to create eco-friendly environment. PO 7 - To prepare expressive, ethical and responsible citizens with proven expertise.	PSO 1 - To have a strong base in theoretical and applied mathematics. PSO 2 - To sharpen their analytical thinking, logical deductions and rigor in reasoning. PSO 3 - To understand the tools required to quantitatively analyze data and have the ability to access and communicate mathematical information. PSO 7 - To understand the applications of mathematics in a global, economic, environmental, and societal context. PSO 8 - To use the techniques, skills and modern technology necessary to communicate effectively with professional and ethical responsibility.	CO 1 - To recall the concept of the theory of probability. CO 2 - To understand the definitions and specification of stochastic processes. CO 3 - To differentiate between different states of Markov system. CO 4 - To categorize different stochastic processes such as Poisson processes, Yule- Fury processes, birth and death processes. CO 5 - To calculate residual and current life times using renewal processes. CO 6 - To select the suitable queuing model in real life situations. CO 7 - To apply the theory to create the correct stochastic model for a given problem.
225	PM17PR	Major: Project	☑	☑	☑	☑	PO 2 - To relate the theory and practical knowledge to solve the problems of the society. PO 3 - To prepare successful professionals in industry, government, academia, research, entrepreneurial pursuits and consulting firms. PO 5 - To carry out internship programmes and research projects to develop scientific skills and innovative ideas. PO 7 - To prepare expressive, ethical and responsible citizens with proven expertise.	PSO 1 - To have a strong base in theoretical and applied mathematics. PSO 5 - To acquire knowledge in recent developments in various branches of mathematics and participate in conferences / seminars / workshops and thus pursue research. PSO 6 - To utilise the knowledge gained for entrepreneurial pursuits. PSO 8 - To use the techniques, skills and modern technology necessary to communicate effectively with professional and ethical responsibility. PSO 9 - To develop proficiency in analyzing, applying and solving scientific problems.	CO 1 - To become aware of current research topics in mathematics and choose a new Research topic. CO 2 - To create the habit of studying Research articles in depth. CO 3 - To submit a formal report to document the outcome of the project and get practice in writing projects. CO 4 - To understand and develop mathematical concepts effectively and correlate the same to other disciplines. CO 5 - To present papers in Conferences/Workshops/Seminars. CO 6 - To apply mathematics creatively and think critically.

#	Code	Course				PO	PSO	CO
226	PM17S1	Self Learning Course: Algebra for SET/CSIR-NET Exam	☑			PO 2 - To face and succeed in high level competitive examinations like NET, GATE and TOFEL. PO 3 - To carry out internship programmes and research projects to develop scientific skills and innovative ideas. PO 4 - To utilize the obtained scientific knowledge to create eco-friendly environment.	PSO 1 - To have a strong base in theoretical and applied mathematics. PSO 2 - To sharpen their analytical thinking, logical deductions and rigour in reasoning. PSO 3 - To use the techniques, skills and modern technology necessary to communicate effectively with professional and ethical responsibilities. PSO 4 - To understand the applications of mathematics in a global economic environmental and social context.	CO 1 - To solve the problems based on vector spaces, subspaces and linear transformations. CO 2 - To understand the significant of linear independence, basis and dimensions. CO 3 - To recall matrix theory, linear equations and finding the rank and determine the determinant of matrices. CO 4 - To determine eigen values and eigen vectors and recall cayley-hamilton theorem. CO 5 - To acquire knowledge in solving problems by using matrix representation of linear transformations and change of basis. CO 6 - To differentiate various forms in matrices. CO 7 - To solve problems in inner product spaces, orthonormal basis and quadratic forms.
227	PM1741	Core XII: Complex Analysis		☑		PO 2 - To relate the theory and practical knowledge to solve the problems of the society. PO 3 - To prepare successful professionals in industry, government, academia, research, entrepreneurial pursuits and consulting firms. PO 5 - To carry out internship programmes and research projects to develop scientific skills and innovative ideas. PO 7 - To prepare expressive, ethical and responsible citizens with proven expertise.	PSO 1 - To have a strong base in theoretical and applied mathematics. PSO 6 - To utilise the knowledge gained for entrepreneurial pursuits. PSO 8 - To use the techniques, skills and modern technology necessary to communicate effectively with professional and ethical responsibility. PSO 9 - To develop proficiency in analyzing, applying and solving scientific problems.	CO 1 - To understand the fundamental concepts of complex variable theory. CO 2 - To effectively locate and use the information needed to prove theorems and establish mathematical results. CO 3 - To demonstrate the ability to integrate knowledge and ideas of complex differentiation and complex integration. CO 4 - To use appropriate techniques for solving related problems and for establishing theoretical results. CO 5 - To evaluate complicated real integrals through residue theorem.
228	PM1742	Core XIII: Functional Analysis		☑		PO 2 - To relate the theory and practical knowledge to solve the problems of the society. PO 3 - To prepare successful professionals in industry, government, academia, research, entrepreneurial pursuits and consulting firms. PO 4 - To face and succeed in high level competitive examinations like NET, GATE and TOFEL. PO 6 - To utilize the obtained scientific knowledge to create eco-friendly environment.	PSO 1 - To have a strong base in theoretical and applied mathematics. PSO 2 - To sharpen their analytical thinking, logical deductions and rigor in reasoning. PSO 5 - To acquire knowledge in recent developments in various branches of mathematics and participate in conferences / seminars / workshops and thus pursue research. PSO 7 - To understand the applications of mathematics in a global, economic, environmental, and societal context.	CO 1 - To learn and understand the definition of linear space , normed linear space, Banach Space and their examples. CO 2 - To explain the concept of different properties of Banach Spaces, Hahn Banach theorem. CO 3 - To compare different types of operators and their properties, Natural imbedding. CO 4 - To explain the ideas needed for open mapping theorem , Open Mapping theorem. CO 5 - To construct the idea of projections , the spectrum of an operator and develop problem solving skills , Matrices, Determinants. CO 6 - To learn and understand the definition of Hilbert Spaces ,Orthogonal Complements. CO 7 - To explain the concept of the adjoint of an operator, Normal and Unitary operators, Spectral Theory.
229	PM1743	Core XIV: Operations Research		☑		PO 3 - To prepare successful professionals in industry, government, academia, research, entrepreneurial pursuits and consulting firms. PO 4 - To face and succeed in high level competitive examinations like NET, GATE and TOFEL. PO 6 - To utilize the obtained scientific knowledge to create eco-friendly environment. PO 7 - To prepare expressive, ethical and responsible citizens with proven expertise.	PSO 1 - To have a strong base in theoretical and applied mathematics. PSO 2 - To sharpen their analytical thinking, logical deductions and rigor in reasoning. PSO 3 - To understand the tools required to quantitatively analyze data and have the ability to access and communicate mathematical information. PSO 6 - To utilise the knowledge gained for entrepreneurial pursuits. PSO 7 - To understand the applications of mathematics in a global, economic, environmental, and societal context.	CO 1 - To explain the fundamental concept of DP model , Inventory model and Queuing model. CO 2 - To relate the concepts of Arrow (Network)diagram representations, in critical path calculations and construction of the Time chart. CO 3 - To distinguish deterministic model and single item. CO 4 - To interpret Poisson and Exponential distributions and apply these concepts in Queuing models. CO 5 - To solve life oriented decision making problems by optimizing the objective function.
230	PM1744	Core XV: Algorithmic Graph Theory		☑		PO 2 - To relate the theory and practical knowledge to solve the problems of the society. PO 3 - To prepare successful professionals in industry, government, academia, research, entrepreneurial pursuits and consulting firms. PO 5 - To carry out internship programmes and research projects to develop scientific skills and innovative ideas.	PSO 1 - To have a strong base in theoretical and applied mathematics. PSO 4 - To write proofs for simple mathematical results. PSO 6 - To utilise the knowledge gained for entrepreneurial pursuits. PSO 9 - To develop proficiency in analyzing, applying and solving scientific problems.	CO 1 - To write algorithms for basic computing and analyse the efficiency of the algorithm. CO 2 - To use effectively algorithmic techniques to study basic parameters and properties of graphs. CO 3 - To use effectively techniques from graph theory, to solve practical problems in networking and communication. CO 4 - To apply the Algorithms in computer science , biology, chemistry, physics, sociology and engineering.
231	PM1745	Elective IV: a) Combinatorics		☑		PO 3 - To prepare successful professionals in industry, government, academia, research, entrepreneurial pursuits and consulting firms. PO 4 - To face and succeed in high level competitive examinations like NET, GATE and TOFEL. PO 5 - To carry out internship programmes and research projects to develop scientific skills and innovative ideas. PO 6 - To utilize the obtained scientific knowledge to create eco-friendly environment. PO 7 - To prepare expressive, ethical and responsible citizens with proven expertise.	PSO 1 - To have a strong base in theoretical and applied mathematics. PSO 2 - To sharpen their analytical thinking, logical deductions and rigor in reasoning. PSO 3 - To understand the tools required to quantitatively analyze data and have the ability to access and communicate mathematical information. PSO 6 - To utilise the knowledge gained for entrepreneurial pursuits. PSO 7 - To understand the applications of mathematics in a global, economic, environmental, and societal context. PSO 9 - To develop proficiency in analyzing, applying and solving scientific problems.	CO 1 - To discuss the basic concepts in permutation and combination, Recurrence Relations. CO 2 - To distinguish between permutation and combination. CO 3 - To correlate recurrence relation and generating function. CO 4 - To solving problems by the technique of generating functions. CO 5 - To interpret the principles of inclusion and exclusion. CO 6 - To develop the concepts of Polya's fundamental theorem and apply in Polya's theory of counting.

#	Code	Course					PO	PSO	CO
232	PM1746	Elective IV: b) Coding Theory				☑	PO 2 - To relate the theory and practical knowledge to solve the problems of the society. PO 5 - To carry out internship programmes and research projects to develop scientific skills and innovative ideas. PO 7 - To prepare expressive, ethical and responsible citizens with proven expertise.	PSO 1 - To have a strong base in theoretical and applied mathematics. PSO 3 - To understand the tools required to quantitatively analyze data and have the ability to access and communicate mathematical information. PSO 4 - To write proofs for simple mathematical results. PSO 8 - To use the techniques, skills and modern technology necessary to communicate effectively with professional and ethical responsibility.	CO 1 - To explain the fundamental concepts of coding theory. CO 2 - To analyze the fundamental problems of coding theory and the properties of specific codes. CO 3 - To translate the fundamental problems to mathematical problems. CO 4 - To construct codes by various methods for the chosen problem. CO 5 - To solve the problems by recalling the concepts of finite field, polynomial rings and finite groups. CO 6 - To apply coding theory in transmission of information in telecommunication (cell phones, data modems etc,.). CO 7 - To design simple cyclic codes with given properties.
233	PM17S2	Self Learning Course: Analysis for SET/CSIR-NET Exam	☑				PO 2 - To face and succeed in high level competitive examinations like NET, GATE and TOFEL. PO 3 - To carry out internship programmes and research projects to develop scientific skills and innovative ideas. PO 4 - To utilize the obtained scientific knowledge to create eco-friendly environment.	PSO 1 - To have a strong base in theoretical and applied mathematics. PSO 2 - To sharpen their analytical thinking, logical deductions and rigour in reasoning. PSO 3 - To understand the tools required to quantitatively analyze data and have the ability to access and communicate mathematical information. PSO 4 - To write proofs for simple mathematical results.	CO 1 - To recall the basic concepts of real number system, archimedian property, convergence and limit points. CO 2 - To acquire knowledge to solve problems based on compactness and connectedness. CO 3 - To understand the definitions and theorems on normed linear space and metric space. CO 4 - To evaluate simple concepts and solve problems related to continuity, uniform continuity and monotonic functions. CO 5 - To analyze the methods for solving problems in Riemann-integrals and improper integrals. CO 6 - To expand the sequences and series for the given problems. CO 7 - To compare convergence and uniform convergence and apply them in solving related problems.
		2019-2020							
234	MC1711	Major Core I: Differential Calculus and Trigonometry	☑				PO 1 - To apply the acquired scientific knowledge to face day to day needs. PO 3 - To carry out field works and projects independently and in collaboration with other institutions and industries. PO 5 - To face challenging competitive examinations that offer rewarding careers in science and education.	PSO 1 - To acquire a strong foundation in various branches of mathematics to formulate real life problems into mathematical models. PSO 2 - To develop problem solving skills, cultivating logical thinking, and face competitive examinations with confidence. PSO 3 - To enhance numerical ability and address problems in interdisciplinary areas which would help in project and field works. PSO 8 - To apply knowledge of principles, concepts and results in specific subject area to analyze their local and global impact.	CO 1 - To recall the idea of derivative, rules of differentiation and understand the concept of p-r equation. CO 2 - To learn the concepts of curvature, circle of curvature, evolute and apply the concepts to solve problems. CO 3 - To recognize the rules of identifying asymptotes and employ the same to different curves. CO 4 - To acquire the knowledge about hyperbolic functions and compare it with circular functions, trigonometric functions, inverse trigonometric functions and their properties. CO 5 - To categorize the methods of finding the sum of trigonometric series.
235	MA1711	Allied I: Algebra and Calculus	☑				PO 1 - To apply the acquired scientific knowledge to face day to day needs. PO 3 - To carry out field works and projects independently and in collaboration with other institutions and industries. PO 5 - To face challenging competitive examinations that offer rewarding careers in science and education.	PSO 1 - To acquire a strong foundation in various branches of mathematics to formulate real life problems into mathematical models. PSO 2 - To develop problem solving skills, cultivating logical thinking, and face competitive examinations with confidence. PSO 3 - To enhance numerical ability and address problems in interdisciplinary areas which would help in project and field works. PSO 4 - To apply the mathematical knowledge and skills to face competitive examination with confidence. PSO 5 - To pursue higher studies which in turn will offer them job opportunities in government and public sector undertakings, banks, central government institutes etc.	CO 1 - To recall the fundamentals of algebraic equations, matrices and rules of integration. CO 2 - To practice the formation of equations and compute symmetric functions of roots in terms of coefficients. CO 3 - To revise the properties of eigen values of the matrices. CO 4 - To learn Beta, Gamma functions and evaluate integrals using them. CO 5 - To practice the expansion of Fourier series and utilize the same for higher studies.
236	MNM171	Non Major Elective Course (NMEC): Mathematics for Life - I			☑		PO 1 - To apply the acquired scientific knowledge to face day to day needs. PO 3 - To carry out field works and projects independently and in collaboration with other institutions and industries. PO 5 - To face challenging competitive examinations that offer rewarding careers in science and education. PO 6 - To impart communicative skills and ethical values.	PSO 1 - To acquire a strong foundation in various branches of mathematics to formulate real life problems into mathematical models. PSO 2 - To develop problem solving skills, cultivating logical thinking, and face competitive examinations with confidence. PSO 3 - To enhance numerical ability and address problems in interdisciplinary areas which would help in project and field works. PSO 5 - To pursue higher studies which in turn will offer them job opportunities in government and public sector undertakings, banks, central government institutes etc. PSO 9 - To communicate appropriately and effectively, in a scientific context using present technology and new findings.	CO 1 - To recall the formation of number system. CO 2 - To review the rules of operations on numbers. CO 3 - To differentiate and compare different types of fractions. CO 4 - To apply BODMAS rule for simplification and determine missing numbers in a sequence. CO 5 - To construct and develop mathematical solutions to simple real life problems.

					PO	PSO	CO
237	MC1721	Major Core II: Classical Algebra and Integral Calculus	☑		PO 1 - To apply the acquired scientific knowledge to face day to day needs. PO 3 - To carry out field works and projects independently and in collaboration with other institutions and industries. PO 5 - To face challenging competitive examinations that offer rewarding careers in science and education. PO 7 - To equip students with hands on training through various courses to enhance entrepreneurship skills.	PSO 1 - To acquire a strong foundation in various branches of mathematics to formulate real life problems into mathematical models. PSO 2 - To develop problem solving skills, cultivating logical thinking, and face competitive examinations with confidence. PSO 3 - To enhance numerical ability and address problems in interdisciplinary areas which would help in project and field works. PSO 6 - To develop entrepreneurial skills, become empowered and self-dependent in society. PSO 8 - To apply knowledge of principles, concepts and results in specific subject area to analyze their local and global impact.	CO 1 - To recall the fundamentals of algebraic equations and rules of integration. CO 2 - To apply fundamental theorem of algebra in framing and solving equations. CO 3 - To choose appropriate method for transformation of equations. CO 4 - To develop the skill of evaluation of double and triple integrals over different regions. CO 5 - To identify Beta, Gamma functions and utilize them for the evaluation of definite integrals. CO 6 - To develop the Fourier series expansion in any interval and apply the same for solving technical and physical problems.
238	MA1721	Allied II: Vector Calculus and Differential Equations	☑		PO 1 - To apply the acquired scientific knowledge to face day to day needs. PO 3 - To carry out field works and projects independently and in collaboration with other institutions and industries. PO 5 - To face challenging competitive examinations that offer rewarding careers in science and education.	PSO 1 - To acquire a strong foundation in various branches of mathematics to formulate real life problems into mathematical models. PSO 2 - To develop problem solving skills, cultivating logical thinking, and face competitive examinations with confidence. PSO 3 - To enhance numerical ability and address problems in interdisciplinary areas which would help in project and field works. PSO 8 - To apply knowledge of principles, concepts and results in specific subject area to analyze their local and global impact.	CO 1 - To explain the physical meaning and properties of curl and divergence. CO 2 - To practice the computation of line integrals, surface integrals. CO 3 - To use computational tools to solve problems and applications of partial differential equations of first order. CO 4 - To find the complementary function and particular integral of a differential equation by using appropriate methods. CO 5 - To use Laplace transform and their inverse to solve differential equations.
239	MNM172	Non Major Elective Course (NME): Mathematics for Life - II		☑	PO 3 - To carry out field works and projects independently and in collaboration with other institutions and industries. PO 5 - To face challenging competitive examinations that offer rewarding careers in science and education. PO 7 - To equip students with hands on training through various courses to enhance entrepreneurship skills.	PSO 1 - To acquire a strong foundation in various branches of mathematics to formulate real life problems into mathematical models. PSO 3 - To enhance numerical ability and address problems in interdisciplinary areas which would help in project and field works. PSO 4 - To apply the mathematical knowledge and skills to face competitive examination with confidence. PSO 6 - To develop entrepreneurial skills, become empowered and self-dependent in society. PSO 8 - To apply knowledge of principles, concepts and results in specific subject area to analyze their local and global impact.	CO 1 - To find the average of numbers and solve some real life problems. CO 2 - To frame equations and solve problems involving ratios and fractions. CO 3 - To apply law of indices and surds to find missing numbers in an expression. CO 4 - To compare surds and ratio. CO 5 - To learn ratio and proportion and practice duplication and triplication of ratios. CO 6 - To employ the problems related to ages and apply the same to real life situations.
240	MC1731	Major Core III: Differential Equations and Vector Calculus	☑		PO 1 - To apply the acquired scientific knowledge to face day to day needs. PO 3 - To carry out field works and projects independently and in collaboration with other institutions and industries. PO 5 - To face challenging competitive examinations that offer rewarding careers in science and education.	PSO 1 - To acquire a strong foundation in various branches of mathematics to formulate real life problems into mathematical models. PSO 2 - To develop problem solving skills, cultivating logical thinking, and face competitive examinations with confidence. PSO 3 - To enhance numerical ability and address problems in interdisciplinary areas which would help in project and field works. PSO 4 - To apply the mathematical knowledge and skills to face competitive examination with confidence. PSO 8 - To apply knowledge of principles, concepts and results in specific subject area to analyze their local and global impact.	CO 1 - To distinguish linear, nonlinear, ordinary and partial differential equations. CO 2 - To solve linear differential equations with constant and variable coefficients. CO 3 - To explain the basic properties of Laplace Transforms and Inverse Laplace Transforms. CO 4 - To use the Laplace transform to find the solution of linear differential equations. CO 5 - To learn methods of forming and solving partial differential equations. CO 6 - To learn differentiation and integration of vector valued functions. CO 7 - To evaluate line and surface integrals using Green's theorem, Stoke's theorem and Gauss divergence theorem. CO 8 - To apply the concepts to solve problems in physical sciences and engineering.
241	MC1732	Major Core IV: Sequences and Series	☑		PO 1 - To apply the acquired scientific knowledge to face day to day needs. PO 3 - To carry out field works and projects independently and in collaboration with other institutions and industries. PO 4 - To reflect upon green initiatives and take responsible steps to build a sustainable environment. PO 5 - To face challenging competitive examinations that offer rewarding careers in science and education.	PSO 1 - To acquire a strong foundation in various branches of mathematics to formulate real life problems into mathematical models. PSO 2 - To develop problem solving skills, cultivating logical thinking, and face competitive examinations with confidence. PSO 3 - To enhance numerical ability and address problems in interdisciplinary areas which would help in project and field works. PSO 4 - To apply the mathematical knowledge and skills to face competitive examination with confidence. PSO 7 - To understand the professional, ethical, legal, security, social issues and responsibilities. PSO 8 - To apply knowledge of principles, concepts and results in specific subject area to analyze their local and global impact.	CO 1 - To explain the primary concepts of sequences and series of real numbers. CO 2 - To define convergence and divergence of sequences and series. CO 3 - To distinguish between convergence and divergence of sequences and series. CO 4 - To relate the behavior of monotonic and geometric sequences and series. CO 5 - To calculate the limit and peak point of sequences. CO 6 - To analyze the importance of Cauchy's general principle of convergence of sequences and series. CO 7 - To evaluate the convergence of series using different types of tests. CO 8 - To develop the skill of analyzing in sequence and series.

242	MA1731	Allied III: Probability Theory and Distributions		☑				PO 1 - To apply the acquired scientific knowledge to face day to day needs. PO 3 - To carry out field works and projects independently and in collaboration with other institutions and industries. PO 5 - To face challenging competitive examinations that offer rewarding careers in science and education. PO 6 - To impart communicative skills and ethical values.	PSO 1 - To acquire a strong foundation in various branches of mathematics to formulate real life problems into mathematical models. PSO 4 - To apply the mathematical knowledge and skills to face competitive examination with confidence. PSO 5 - To pursue higher studies which in turn will offer them job opportunities in government and public sector undertakings, banks, central government institutes etc. PSO 8 - To apply knowledge of principles, concepts and results in specific subject area to analyze their local and global impact. PSO 9 - To communicate appropriately and effectively, in a scientific context using present technology and new findings	CO 1 - To recall the definition of probability and set functions. CO 2 - To differentiate between probability and conditional probability and compute according to the requirement. CO 3 - To understand the definition of random variables, their types and related concepts. CO 4 - To detect the different probability distributions which are widely used. CO 5 - To apply the techniques to prove the properties of probability and related distributions. CO 6 - To choose the suitable probability distribution corresponding to a given data. CO 7 - To test the validity of a given data.
243	MC17S1	Self-Learning Course: Discrete Mathematics I		☑				PO 1 - To apply the acquired scientific knowledge to face day to day needs. PO 5 - To face challenging competitive examinations that offer rewarding careers in science and education.	PSO 1 - To acquire a strong foundation in various branches of mathematics to formulate real life problems into mathematical models. PSO 4 - To apply the mathematical knowledge and skills to face competitive examination with confidence. PSO 5 - To pursue higher studies which in turn will offer them job opportunities in government and public sector undertakings, banks, central government institutes etc.	CO 1 - To learn some important notions of graph theory. CO 2 - To be familiar with the definitions of basic graph theory. CO 3 - To give matrix representation of various graphs. CO 4 - To prove simple results in graph theory. CO 5 - To write algorithms for proven results. CO 6 - To understand the basics of relations and functions. CO 7 - To classify the types of functions and relations. CO 8 - To draw the graphs of given functions. CO 9 - To cite examples of different types of functions CO 10 - To analyze the difference between a relation and a function
244	MC1741	Major Core V: Groups and Rings		☑				PO 1 - To apply the acquired scientific knowledge to face day to day needs. PO 3 - To carry out field works and projects independently and in collaboration with other institutions and industries. PO 5 - To face challenging competitive examinations that offer rewarding careers in science and education.	PSO 1 - To acquire a strong foundation in various branches of mathematics to formulate real life problems into mathematical models. PSO 4 - To apply the mathematical knowledge and skills to face competitive examination with confidence. PSO 5 - To pursue higher studies which in turn will offer them job opportunities in government and public sector undertakings, banks, central government institutes etc. PSO 8 - To apply knowledge of principles, concepts and results in specific subject area to analyze their local and global impact.	CO 1 - To recall the definitions of groups ,rings, functions and also examples of groups and rings. CO 2 - To explain the properties of groups, rings and different types of groups and rings. CO 3 - To develop proofs of results on Permutation groups ,Cyclic groups, Quotient group, Subgroups, sub rings , quotient rings. CO 4 - To examine the properties of Ideals, Maximal and Prime ideals, Cosets, Order of an element. CO 5 - To test the homomorphic and isomorphic properties of groups and rings. CO 6 - To develop the concepts of ordered integral domains and Unique Factorization Domains. CO 7 - To apply the theory of Groups and Rings and solve problems.
245	MC1742	Major Core VI: Analytical Geometry of 3 Dimensions		☑				PO 1 - To apply the acquired scientific knowledge to face day to day needs. PO 3 - To carry out field works and projects independently and in collaboration with other institutions and industries. PO 5 - To face challenging competitive examinations that offer rewarding careers in science and education. PO 7 - To equip students with hands on training through various courses to enhance entrepreneurship skills.	PSO 1 - To acquire a strong foundation in various branches of mathematics to formulate real life problems into mathematical models. PSO 2 - To develop problem solving skills, cultivating logical thinking, and face competitive examinations with confidence. PSO 3 - To enhance numerical ability and address problems in interdisciplinary areas which would help in project and field works. PSO 4 - To apply the mathematical knowledge and skills to face competitive examination with confidence. PSO 6 - To develop entrepreneurial skills, become empowered and self-dependent in society.	CO 1 - To recall the basic definitions and concepts of planes and lines. CO 2 - To demonstrate the Projection of the line joining two points, Cosines of the line joining two points and will be able to solve problems. CO 3 - To calculate the distance between points, lines and planes and the angles between lines and planes. CO 4 - To draw three dimensional surfaces from the given information. CO 5 - To discuss the characteristics and properties of 3-dimensional objects like sphere, cube etc. CO 6 - To develop the skill in 3-dimensional geometry to gain mastery in related courses.
246	MA1741	Allied IV: Applied Statistics		☑				PO 1 - To apply the acquired scientific knowledge to face day to day needs. PO 3 - To carry out field works and projects independently and in collaboration with other institutions and industries. PO 4 - To reflect upon green initiatives and take responsible steps to build a sustainable environment. PO 5 - To face challenging competitive examinations that offer rewarding careers in science and education.	PSO 1 - To acquire a strong foundation in various branches of mathematics to formulate real life problems into mathematical models. PSO 4 - To apply the mathematical knowledge and skills to face competitive examination with confidence. PSO 7 - To understand the professional, ethical, legal, security, social issues and responsibilities. PSO 8 - To apply knowledge of principles, concepts and results in specific subject area to analyze their local and global impact.	CO 1 - To identify and demonstrate appropriate sampling processes. CO 2 - To recall the methods of classifying and analyzing data relative to single variable. CO 3 - To describe the χ^2 distribution in statistics. CO 4 - To distinguish between the practical purposes of a large and a small sample. CO 5 - To understand that correlation coefficient is independent of the change of origin and scale.
247	MC17S2	Self-Learning Course: Discrete Mathematics II		☑				PO 1 - To apply the acquired scientific knowledge to face day to day needs. PO 5 - To face challenging competitive examinations that offer rewarding careers in science and education.	PSO 1 - To acquire a strong foundation in various branches of mathematics to formulate real life problems into mathematical models. PSO 2 - To develop problem solving skills, cultivating logical thinking, and face competitive examinations with confidence. PSO 4 - To apply the mathematical knowledge and skills to face competitive examination with confidence. PSO 5 - To pursue higher studies which in turn will offer them job opportunities in government and public sector undertakings, banks, central government institutes etc.	CO 1 - To interpret mathematical notation and mathematical definitions. CO 2 - To define eigen values and eigen vectors. CO 3 - To develop a historical perspective of modern discrete mathematics. CO 4 - To explain the Basic Boolean Algebra laws. CO 5 - To evaluate discrete mathematics problems that involve computing permutations and combinations of a set. CO 6 - To relate distributive lattice and complimented lattice.

No	Code	Title					PO	PSO	CO
248	MC1751	Major Core VII: Linear Algebra		☑			PO 1 - To apply the acquired scientific knowledge to face day to day needs. PO 3 - To carry out field works and projects independently and in collaboration with other institutions and industries. PO 5 - To face challenging competitive examinations that offer rewarding careers in science and education.	PSO 1 - To acquire a strong foundation in various branches of mathematics to formulate real life problems into mathematical models. PSO 2 - To develop problem solving skills, cultivating logical thinking, and face competitive examinations with confidence. PSO 3 - To enhance numerical ability and address problems in interdisciplinary areas which would help in project and field works.	CO 1 - To recall and define Groups ,Fields and their properties. CO 2 - To cite examples of vector spaces ,subspaces and linear transformations. CO 3 - To determine the concepts of linear independence, linear dependence , basis and dimension of vector spaces. CO 4 - To correlate rank and nullity ,Linear transformation and matrix of a Linear transformation. CO 5 - To examine whether a given space is an inner product space and the orthonormality of sets.
249	MC1752	Major Core VIII: Real Analysis		☑			PO 1 - To apply the acquired scientific knowledge to face day to day needs. PO 3 - To carry out field works and projects independently and in collaboration with other institutions and industries. PO 4 - To reflect upon green initiatives and take responsible steps to build a sustainable environment. PO 5 - To face challenging competitive examinations that offer rewarding careers in science and education. PO 6 - impart communicative skills and ethical values	PSO 1 - To acquire a strong foundation in various branches of mathematics to formulate real life problems into mathematical models. PSO 4 - To apply the mathematical knowledge and skills to face competitive examination with confidence. PSO 7 - To understand the professional, ethical, legal, security, social issues and responsibilities. PSO 8 - To apply knowledge of principles, concepts and results in specific subject area to analyze their local and global impact. PSO 9 - To communicate appropriately and effectively, in a scientific context using present technology and new findings.	CO 1 - To understand the concepts of completeness, continuity and discontinuity of metric spaces. CO 2 - To apply the metric space theorems to real life situations. CO 3 - To distinguish between continuous functions and uniform continuous functions. CO 4 - To use basic concepts in the development of real analysis results. CO 5 - To understand the concepts of countable sets, metric space, connectedness, compactness of metric spaces. CO 6 - To develop the ability to reflect on problems that are quite significant in the field of real analysis.
250	MC1753	Major Core IX: Graph Theory		☑			PO 1 - To apply the acquired scientific knowledge to face day to day needs. PO 3 - To carry out field works and projects independently and in collaboration with other institutions and industries. PO 5 - To face challenging competitive examinations that offer rewarding careers in science and education.	PSO 1 - To acquire a strong foundation in various branches of mathematics to formulate real life problems into mathematical models. PSO 2 - To develop problem solving skills, cultivating logical thinking, and face competitive examinations with confidence. PSO 3 - To enhance numerical ability and address problems in interdisciplinary areas which would help in project and field works. PSO 4 - To apply the mathematical knowledge and skills to face competitive examination with confidence.	CO 1 - To understand the basic definitions to write the proofs of simple theorems. CO 2 - To employ the definitions to write the proofs of simple theorems. CO 3 - To relate real life situations with mathematical graphs. CO 4 - To develop the ability to solve problems in graph theory. CO 5 - To analyze real life problems using graph theory both quantitatively and qualitatively.
251	MC1754	Major: Project	☑	☑	☑	☑	PO 1 - To apply the acquired scientific knowledge to face day to day needs. PO 3 - To carry out field works and projects independently and in collaboration with other institutions and industries. PO 5 - To face challenging competitive examinations that offer rewarding careers in science and education.	PSO 1 - To acquire a strong foundation in various branches of mathematics to formulate real life problems into mathematical models. PSO 3 - To enhance numerical ability and address problems in interdisciplinary areas which would help in project and field works. PSO 4 - To apply the mathematical knowledge and skills to face competitive examination with confidence. PSO 5 - To pursue higher studies which in turn will offer them job opportunities in government and public sector undertakings, banks, central government institutes etc.	CO 1 - To choose a new topic of their interest. CO 2 - To develop the attitude of studying a topic in depth independently. CO 3 - To express their views with confidence in a group. CO 4 - To relate with the group members and reap the best harvest. CO 5 - To develop communication skills through oral presentation. CO 6 - To create a taste for research in mathematics. CO 7 - To develop confidence to face interviews. CO 8 - To interpret and analyze data mathematically.
252	MC1755	Elective I: a) Numerical Methods		☑			PO 1 - To apply the acquired scientific knowledge to face day to day needs. PO 3 - To carry out field works and projects independently and in collaboration with other institutions and industries. PO 5 - To face challenging competitive examinations that offer rewarding careers in science and education.	PSO 1 - To acquire a strong foundation in various branches of mathematics to formulate real life problems into mathematical models. PSO 2 - To develop problem solving skills, cultivating logical thinking, and face competitive examinations with confidence. PSO 3 - To enhance numerical ability and address problems in interdisciplinary areas which would help in project and field works. PSO 4 - To apply the mathematical knowledge and skills to face competitive examination with confidence.	CO 1 - To understand the basic definitions and meaning of interpolation. CO 2 - To select appropriate numerical methods and apply the same to various types of problems. CO 3 - To apply numerical methods to obtain approximate solutions to mathematical problems. CO 4 - To employ different methods of constructing a polynomial using various methods. CO 5 - To compare the rate of convergence of different numerical formula. CO 6 - To distinguish the advantages and disadvantages of various numerical methods.
253	MC1756	Elective I: b) Fuzzy Mathematics		☑		☑	PO 1 - To apply the acquired scientific knowledge to face day to day needs. PO 3 - To carry out field works and projects independently and in collaboration with other institutions and industries. PO 5 - To face challenging competitive examinations that offer rewarding careers in science and education.	PSO 1 - To acquire a strong foundation in various branches of mathematics to formulate real life problems into mathematical models. PSO 2 - To develop problem solving skills, cultivating logical thinking, and face competitive examinations with confidence. PSO 3 - To enhance numerical ability and address problems in interdisciplinary areas which would help in project and field works. PSO 4 - To apply the mathematical knowledge and skills to face competitive examination with confidence.	CO 1 - To understand the basic mathematical operations carried out on fuzzy sets. CO 2 - To compare fuzzy sets with crisp sets. CO 3 - To explain classical logic and fuzzy logic. CO 4 - To describe the significance of fuzzy systems and genetic algorithms. CO 5 - To solve problems that are appropriately solved by neural networks , fuzzy logic and genetic algorithms. CO 6 - To apply the concepts fuzzy systems and neural networks in various fields like machine intelligence and robotics. CO 7 - To differentiate between Possibility theory and Probability theory.

#	Code	Course				PO	PSO	CO
254	MC1757	Elective I: c) Object Oriented Programming with C++			☑	PO 1 - To apply the acquired scientific knowledge to face day to day needs. PO 3 - To carry out field works and projects independently and in collaboration with other institutions and industries. PO 5 - To face challenging competitive examinations that offer rewarding careers in science and education.	PSO 1 - To acquire a strong foundation in various branches of mathematics to formulate real life problems into mathematical models. PSO 2 - To develop problem solving skills, cultivating logical thinking, and face competitive examinations with confidence. PSO 3 - To enhance numerical ability and address problems in interdisciplinary areas which would help in project and field works. PSO 4 - To apply the mathematical knowledge and skills to face competitive examination with confidence. PSO 5 - To pursue higher studies which in turn will offer them job opportunities in government and public sector undertakings, banks, central government institutes etc.	CO 1 - To apply C++ features to program design and implementation. CO 2 - To explain object oriented concepts and describe how they are supported by C++. CO 3 - To use C++ to demonstrate practical experience in developing object oriented solutions. CO 4 - To design and implement programs using C++. CO 5 - To analyze a problem description and design object oriented software using good coding practices and techniques. CO 6 - To implement an achievable practical applications and analyze issues related to object oriented techniques in the C++ programming language. CO 7 - To use common software patterns in object oriented design and recognize their applicability to other software development contexts. CO 8 - To create application using C++ programming language. CO 9 - To write algorithm for programs
255	MSK175	Skill Based Course: Mathematics for Competitive Examination - I		☑		PO 1 - To apply the acquired scientific knowledge to face day to day needs. PO 3 - To carry out field works and projects independently and in collaboration with other institutions and industries. PO 5 - To face challenging competitive examinations that offer rewarding careers in science and education.	PSO 1 - To acquire a strong foundation in various branches of mathematics to formulate real life problems into mathematical models. PSO 2 - To develop problem solving skills, cultivating logical thinking, and face competitive examinations with confidence. PSO 3 - To enhance numerical ability and address problems in interdisciplinary areas which would help in project and field works. PSO 4 - To apply the mathematical knowledge and skills to face competitive examination with confidence. PSO 5 - To pursue higher studies which in turn will offer them job opportunities in government and public sector undertakings, banks, central government institutes etc.	CO 1 - To recall the problems on percentage. CO 2 - To discuss the problems on population and depreciation. CO 3 - To conversion of decimal into percentage and vice versa. CO 4 - To use percentage concept to solve applied technical problems. CO 5 - To analyze the problems related to inlet and outlet of the tank. CO 6 - To evaluate time and distance related problems. CO 7 - To create the ability to make an appropriate mixture.
256	MC1761	Major Core X: Complex Analysis	☑			PO 1 - To apply the acquired scientific knowledge to face day to day needs. PO 3 - To carry out field works and projects independently and in collaboration with other institutions and industries. PO 5 - To face challenging competitive examinations that offer rewarding careers in science and education.	PSO 1 - To acquire a strong foundation in various branches of mathematics to formulate real life problems into mathematical models. PSO 3 - To enhance numerical ability and address problems in interdisciplinary areas which would help in project and field works. PSO 4 - To apply the mathematical knowledge and skills to face competitive examination with confidence. PSO 8 - To apply knowledge of principles, concepts and results in specific subject area to analyze their local and global impact.	CO 1 - To understand the geometric representation of complex numbers. CO 2 - To use differentiation rules to compute derivatives and express complex- differentiable functions as power series. CO 3 - To compute line integrals by using Cauchy's integral theorem and formula. CO 4 - To identify the isolated singularities of a function and determine whether they are removable, poles or essential. CO 5 - To evaluate definite integrals by using residues theorem.
257	MC1762	Major Core XI: Mechanics	☑			PO 1 - To apply the acquired scientific knowledge to face day to day needs. PO 4 - To reflect upon green initiatives and take responsible steps to build a sustainable environment. PO 5 - To face challenging competitive examinations that offer rewarding careers in science and education. PO 7 - To equip students with hands on training through various courses to enhance entrepreneurship skills.	PSO 1 - To acquire a strong foundation in various branches of mathematics to formulate real life problems into mathematical models. PSO 2 - To develop problem solving skills, cultivating logical thinking, and face competitive examinations with confidence. PSO 4 - To apply the mathematical knowledge and skills to face competitive examination with confidence. PSO 6 - To develop entrepreneurial skills, become empowered and self-dependent in society. PSO 7 - To understand the professional, ethical, legal, security, social issues and responsibilities.	CO 1 - To calculate the reactions necessary to ensure static equilibrium. CO 2 - To apply the principles of static equilibrium to particles and rigid bodies. CO 3 - To understand the ways of distributing loads. CO 4 - To identify internal forces and moments of a rigid body. CO 5 - To apply the basic principles of projectiles into real world problems. CO 6 - To classify the laws of friction. CO 7 - To describe energy methods for particles and systems of particles. CO 8 - To understand the general principles of dynamics. CO 9 - To differentiate the various frictional forces.
258	MC1763	Major Core XII: Number Theory	☑			PO 1 - To apply the acquired scientific knowledge to face day to day needs. PO 3 - To carry out field works and projects independently and in collaboration with other institutions and industries.	PSO 1 - To acquire a strong foundation in various branches of mathematics to formulate real life problems into mathematical models. PSO 2 - To develop problem solving skills, cultivating logical thinking, and face competitive examinations with confidence. PSO 3 - To enhance numerical ability and address problems in interdisciplinary areas which would help in project and field works. PSO 5 - To pursue higher studies which in turn will offer them job opportunities in government and public sector undertakings, banks, central government institutes etc. PSO 6 - To develop entrepreneurial skills, become empowered and self-dependent in society. PSO 7 - To understand the professional, ethical, legal, security, social issues and responsibilities. PSO 8 - To apply knowledge of principles, concepts and results in specific subject area to analyze their local and global impact.	CO 1 - To express the concepts and results of divisibility of integers effectively. CO 2 - To construct mathematical proofs of theorems and find counter examples for false statements. CO 3 - To collect and use numerical data to form conjectures about the integers. CO 4 - To understand the logic and methods behind the major proofs in Number Theory. CO 5 - To solve challenging problems related to Chinese remainder theorem effectively. CO 6 - To build up the basic theory of the integers from a list of axioms. CO 7 - To explore some current research problems in number theory. CO 8 - To apply Fermat's theorem and Wilsons theorem effectively. CO 9 - To use mathematical induction and other types of proof writing techniques CO 10 - To understand and utilize mathematical functions and empirical principles and processes

No.	Code	Course						PO	PSO	CO
259	MC1764	Major Core XIII: Operations Research	☑					PO 1 - To apply the acquired scientific knowledge to face day to day needs. PO 3 - To carry out field works and projects independently and in collaboration with other institutions and industries. PO 5 - To face challenging competitive examinations that offer rewarding careers in science and education.	PSO 1 - To acquire a strong foundation in various branches of mathematics to formulate real life problems into mathematical models. PSO 3 - To enhance numerical ability and address problems in interdisciplinary areas which would help in project and field works. PSO 4 - To apply the mathematical knowledge and skills to face competitive examination with confidence.	CO 1 - To understand the origin and development of Operations Research. CO 2 - To explain what is an LPP. CO 3 - To define how to formulate an LPP with linear constraints. CO 4 - To maximize the profit, minimize the cost, minimize the time in transportation problem, Travelling salesman problem, Assignment problem. CO 5 - To identify a problem in your locality, formulate it as an LPP and solve.
260	MC1765	Elective II: a) Astronomy		☑				PO 1 - To apply the acquired scientific knowledge to face day to day needs. PO 5 - To face challenging competitive examinations that offer rewarding careers in science and education.	PSO 1 - To acquire a strong foundation in various branches of mathematics to formulate real life problems into mathematical models. PSO 2 - To develop problem solving skills, cultivating logical thinking, and face competitive examinations with confidence. PSO 4 - To apply the mathematical knowledge and skills to face competitive examination with confidence.	CO 1 - To define the spherical trigonometry of the celestial sphere. CO 2 - To discuss the Kepler's laws. CO 3 - To calculate the maximum and minimum number of eclipses near a node in a year. CO 4 - To interpret latitude and longitude and apply this to find the latitude and longitude of a particular place. CO 5 - To distinguish between geometric parallax and horizontal parallax.
261	MC1766	Elective II: b) Boolean Algebra	☑					PO 1 - To apply the acquired scientific knowledge to face day to day needs. PO 5 - To face challenging competitive examinations that offer rewarding careers in science and education.	PSO 1 - To acquire a strong foundation in various branches of mathematics to formulate real life problems into mathematical models. PSO 2 - To develop problem solving skills, cultivating logical thinking, and face competitive examinations with confidence. PSO 5 - To pursue higher studies which in turn will offer them job opportunities in government and public sector undertakings, banks, central government institutes etc.	CO 1 - To discuss the primary concepts of Lattices and Boolean algebra. CO 2 - To recognize upper bound, lower bound, greatest lower bound. CO 3 - To differentiate between lattices and complete lattices. CO 4 - To relate the concepts of lattice homomorphism and isomorphism. CO 5 - To formulate problems in Lattices and Boolean Algebra.
262	MC1767	Elective II: c) Web Designing with HTML	☑					PO 1 - To apply the acquired scientific knowledge to face day to day needs. PO 5 - To face challenging competitive examinations that offer rewarding careers in science and education.	PSO 1 - To acquire a strong foundation in various branches of mathematics to formulate real life problems into mathematical models. PSO 2 - To develop problem solving skills, cultivating logical thinking, and face competitive examinations with confidence. PSO 4 - To apply the mathematical knowledge and skills to face competitive examination with confidence.	CO 1 - To define modern protocols and systems used on the web(such as HTML,HTTP). CO 2 - To employ fundamental knowledge on web designing with makeup language. CO 3 - To gain strong knowledge in HTML. CO 4 - To use critical thinking skills to design and implement an interactive websites with regard to issues of usability, accessibility and internationalism. CO 5 - To pursue future courses in website development and design.
263	MSK176	Skill Based Course: Mathematics for Competitive Examination - II			☑			PO 1 - To apply the acquired scientific knowledge to face day to day needs. PO 5 - To face challenging competitive examinations that offer rewarding careers in science and education.	PSO 1 - To acquire a strong foundation in various branches of mathematics to formulate real life problems into mathematical models. PSO 2 - To develop problem solving skills, cultivating logical thinking, and face competitive examinations with confidence. PSO 4 - To apply the mathematical knowledge and skills to face competitive examination with confidence. PSO 5 - To pursue higher studies which in turn will offer them job opportunities in government and public sector undertakings, banks, central government institutes etc.	CO 1 - To recognize the difference between volume and surface areas. CO 2 - To demonstrate the basic concepts of Compound interest. CO 3 - To apply analytical techniques to solve stocks and shares problems. CO 4 - To calculate time taken by the train to pass a pole and similar problems. CO 5 - To compare the surface areas of cuboid and cube. CO 6 - To evaluate the volume of cylinder. CO 7 - To measure the surface area of the sphere. CO 8 - To examine the face value and market value.
264	PM1711	Core I: Algebra I		☑				PO 4 - To face and succeed in high level competitive examinations like NET, GATE and TOFEL. PO 5 - To carry out internship programmes and research projects to develop scientific skills and innovative ideas. PO 6 - To utilize the obtained scientific knowledge to create eco-friendly environment. PO 7 - To prepare expressive, ethical and responsible citizens with proven expertise.	PSO 1 - To acquire a strong foundation in various branches of mathematics to formulate real life problems into mathematical models. PSO 2 - To sharpen their analytical thinking, logical deductions and rigor in reasoning. PSO 3 - To understand the tools required to quantitatively analyze data and have the ability to access and communicate mathematical information. PSO 4 - To write proofs for simple mathematical results. PSO 7 - To understand the applications of mathematics in a global, economic, environmental, and societal context. PSO 9 - To develop proficiency in analyzing, applying and solving scientific problems	CO 1 - To understand the concepts of automorphism, inner automorphism, Sylow P- subgroups, finite abelian groups, characteristic, subgroups of groups. CO 2 - To analyze and demonstrate examples of various Sylow P- subgroups, automophisms. CO 3 - To develop proofs for Sylow's theorems , Fundamental theorem of finite abelian groups, direct products, Cauchy's theorem, automorphisms of groups. CO 4 - To understand various definitions related to rings and ideals and illustrate. CO 5 - To develop the way of embedding of rings and design proofs for theorems related to rings. CO 6 - To understand the concepts of Euclidean domain and factorization domain and give illustrations. CO 7 - To compare Euclidean and Unique factorization domains and develop the capacity for proving the concepts.
265	PM1712	Core II: Analysis I		☑				PO 2 - To relate the theory and practical knowledge to solve the problems of the society. PO 5 - To carry out internship programmes and research projects to develop scientific skills and innovative ideas. PO 7 - To prepare expressive, ethical and responsible citizens with proven expertise.	PSO 1 - To have a strong base in theoretical and applied mathematics. PSO 3 - To understand the tools required to quantitatively analyze data and have the ability to access and communicate mathematical information. PSO 8 - To use the techniques, skills and modern technology necessary to communicate effectively with professional and ethical responsibility. PSO 9 - To develop proficiency in analyzing, applying and solving scientific problems.	CO 1 - To explain the fundamental concepts of analysis and their role in modern mathematics. CO 2 - To deal with various examples of metric space, compact sets and completeness in Euclidean space. CO 3 - To learn techniques for testing the convergence of sequences and series. CO 4 - To understand the Cauchy's criterion for convergence of real and complex sequence and series. CO 5 - To apply the techniques for testing the convergence of sequence and series. CO 6 - To understand the important theorems such as Intermediate valued theorem, Mean value theorem, Roll's theorem, Taylor and L'Hospital theorem. CO 7 - To apply the concepts of differentiation in problems.

#	Code	Course				✓	PO	PSO	CO
266	PM1713	Core III: Probability and Statistics				☑	PO 2 - To relate the theory and practical knowledge to solve the problems of the society. PO 3 - To prepare successful professionals in industry, government, academia, research, entrepreneurial pursuits and consulting firms. PO 4 - To face and succeed in high level competitive examinations like NET, GATE and TOFEL. PO 6 - To utilize the obtained scientific knowledge to create eco-friendly environment. PO 7 - To prepare expressive, ethical and responsible citizens with proven expertise .	PSO 1 - To have a strong base in theoretical and applied mathematics. PSO 2 - To sharpen their analytical thinking, logical deductions and rigor in reasoning. PSO 3 - To understand the tools required to quantitatively analyze data and have the ability to access and communicate mathematical information. PSO 5 - To acquire knowledge in recent developments in various branches of mathematics and participate in conferences / seminars / workshops and thus pursue research. PSO 7 - To understand the applications of mathematics in a global, economic, environmental, and societal context. PSO 8 - To use the techniques, skills and modern technology necessary to communicate effectively with professional and ethical responsibility.	CO 1 - To recall the basic probability axioms,conditional probability, random variables and related concepts. CO 2 - To compute marginal and conditional distributions and check the stochastic independence. CO 3 - To recall Binomial, Poisson and Normal distributions and learn new distributions such as multinomial, Chi square and Bivariate normal distributions. CO 4 - To learn the transformation technique for finding the p.d.f of functions of random variables and use these techniques to solve related problems. CO 5 - To employ the relevant concepts of analysis to determine limiting distributions of random variables. CO 6 - To design probability models to deal with real world problems and solve problems involving probabilistic situations.
267	PM1714	Core IV: Ordinary Differential Equations				☑	PO 2 - To relate the theory and practical knowledge to solve the problems of the society. PO 5 - To carry out internship programmes and research projects to develop scientific skills and innovative ideas. PO 6 - To utilize the obtained scientific knowledge to create eco-friendly environment. PO 7 - To prepare expressive, ethical and responsible citizens with proven expertise.	PSO 1 - To have a strong base in theoretical and applied mathematics. PSO 3 - To understand the tools required to quantitatively analyze data and have the ability to access and communicate mathematical information. PSO 7 - To understand the applications of mathematics in a global, economic, environmental, and societal context. PSO 9 - To develop proficiency in analyzing, applying and solving scientific problems.	CO 1 - To recall the definitions of degree and order of differential equations and determine whether a system of functions is linearly independent using the Wronskian definition. CO 2 - To solve linear ordinary differential equations with constant coefficients by using power series expansion. CO 3 - To determine the solutions for a linear system of first order equations. CO 4 - To learn Boundary Value Problems and find the Eigen values and Eigen functions for a given Sturm Liouville Problem. CO 5 - To analyze the concepts of existence and uniqueness of solutions of the ordinary differential equations. CO 6 - To create differential equations for a large number of real world problems.
268	PM1715	Elective I: a) Numerical Analysis				☑	PO 2 - Torelate the theory and practical knowledge to solve the problems of the society. PO 3 - To prepare successful professionals in industry, government, academia, research, entrepreneurial pursuits and consulting firms. PO 5 - To carry out internship programmes and research projects to develop scientific skills and innovative ideas. PO 7 - To prepare expressive, ethical and responsible citizens with proven expertise.	PSO 1 - To have a strong base in theoretical and applied mathematics. PSO 3 - To understand the tools required to quantitatively analyze data and have the ability to access and communicate mathematical information. PSO 5 - To acquire knowledge in recent developments in various branches of mathematics and participate in conferences / seminars / workshops and thus pursue research. PSO 9 - To develop proficiency in analyzing, applying and solving scientific problems.	CO 1 - To recall the methods of finding the roots of the algebraic and transcendental equations. CO 2 - To derive appropriate numerical methods to solve algebraic and transcendental equations. CO 3 - To understand the significance of the finite, forward, backward and central differences and their properties. CO 4 - To draw the graphical representation of each numerical method. CO 5 - To solve the differential and integral problems by using numerical methods (Eg. Trapezoidal rule, Simpson's rule etc.). CO 6 - To solve the problems in ODE by using Taylor's series method, Euler's method etc. CO 7 - To differentiate the solutions obtained by Numerical methods and exact solutions. CO 8 - To compute the solutions of a system of equations by using appropriate numerical methods.
269	PM1716	Elective I: b) Fuzzy Sets and Fuzzy Logic				☑	PO 2 - To relate the theory and practical knowledge to solve the problems of the society. PO 3 - To prepare successful professionals in industry, government, academia, research, entrepreneurial pursuits and consulting firms. PO 4 - To face and succeed in high level competitive examinations like NET, GATE and TOFEL. PO 5 - To carry out internship programmes and research projects to develop scientific skills and innovative ideas. PO 7 - To prepare expressive, ethical and responsible citizens with proven expertise.	PSO 1 - To have a strong base in theoretical and applied mathematics. PSO 2 - To sharpen their analytical thinking, logical deductions and rigor in reasoning. PSO 3 - To understand the tools required to quantitatively analyze data and have the ability to access and communicate mathematical information. PSO 5 - To acquire knowledge in recent developments in various branches of mathematics and participate in conferences / seminars / workshops and thus pursue research. PSO 9 - To develop proficiency in analyzing, applying and solving scientific problems.	CO 1 - To recall the definition of fuzzy subsets and operations on fuzzy subsets. CO 2 - To understand fuzzy arithmetic and operations on fuzzy numbers. CO 3 - To distinguish between crisp sets and fuzzy subsets at the conceptual level. CO 4 - To become familiar with fuzzy relations and the properties of these relations. CO 5 - To apply fuzzy relations and binary fuzzy relations in solving problems.
270	PM1721	Core V: Algebra II				☑	PO 2 - To relate the theory and practical knowledge to solve the problems of the society. PO 3 - To prepare successful professionals in industry, government, academia, research, entrepreneurial pursuits and consulting firms. PO 5 - To carry out internship programmes and research projects to develop scientific skills and innovative ideas. PO 7 - To prepare expressive, ethical and responsible citizens with proven expertise.	PSO 1 - To have a strong base in theoretical and applied mathematics. PSO 3 - To understand the tools required to quantitatively analyze data and have the ability to access and communicate mathematical information. PSO 5 - To acquire knowledge in recent developments in various branches of mathematics and participate in conferences / seminars / workshops and thus pursue research. PSO 6 - To utilise the knowledge gained for entrepreneurial pursuits. PSO 9 - To develop proficiency in analyzing, applying and solving scientific problems.	CO 1 - To recall finite and infinite dimensional vector spaces and subspaces and their properties. CO 2 - To compute inner products and determine orthogonality on vector spaces, including Gram-Schmidt Orthogonalization. CO 3 - To use the definition and properties of Linear transformation and matrices of Linear transformation and change of basis including kernel and range. CO 4 - To compute the characteristic polynomial, eigen vectors, eigen values and eigen spaces as well as the geometric and the algebraic multiplicities of an eigen value. CO 5 - To analyse invariant subspaces, cyclic subspaces and T-annihilator. CO 6 - To cite examples of roots of polynomials and splitting fields.

271	PM1722	Core VI: Analysis II				☑	PO 2 - To relate the theory and practical knowledge to solve the problems of the society. PO 4 - To face and succeed in high level competitive examinations like NET, GATE and TOFEL. PO 5 - To carry out internship programmes and research projects to develop scientific skills and innovative ideas. PO 6 - To utilize the obtained scientific knowledge to create eco-friendly environment. PO 7 - To prepare expressive, ethical and responsible citizens with proven expertise.	PSO 1 - To have a strong base in theoretical and applied mathematics. PSO 2 - To sharpen their analytical thinking, logical deductions and rigor in reasoning. PSO 3 - To understand the tools required to quantitatively analyze data and have the ability to access and communicate mathematical information. PSO 7 - To understand the applications of mathematics in a global, economic, environmental, and societal context. PSO 9 - To develop proficiency in analyzing, applying and solving scientific problems.	CO 1 - To recall the definition of continuity, boundedness and some results on uniform convergence. CO 2 - To recognise the differences between pointwise and uniform convergence of a sequence of functions and Riemann Stieltjes integrals. CO 3 - To understand the close relation between equicontinuity and uniform convergence of sequence of continuous function and rectifiable curves. CO 4 - To learn Parseval's theorem, Stone Weierstrass theorem and know about its physical significance in terms of the power of the Fourier components. CO 5 - To utilize the definition of differentiation and partial derivative of function of several variables to solve problems. CO 6 - To interpret the concept of the contraction principle and the inverse function theorem.
272	PM1723	Core VII: Partial Differential Equations				☑	PO 2 - To relate the theory and practical knowledge to solve the problems of the society. PO 5 - To carry out internship programmes and research projects to develop scientific skills and innovative ideas. PO 6 - To utilize the obtained scientific knowledge to create eco-friendly environment. PO 7 - To prepare expressive, ethical and responsible citizens with proven expertise.	PSO 1 - To have a strong base in theoretical and applied mathematics. PSO 3 - To understand the tools required to quantitatively analyze data and have the ability to access and communicate mathematical information. PSO 7 - To understand the applications of mathematics in a global, economic, environmental, and societal context. PSO 8 - To use the techniques, skills and modern technology necessary to communicate effectively with professional and ethical responsibility. PSO 9 - To develop proficiency in analyzing, applying and solving scientific problems.	CO 1 - To recall the definitions of complete integral, particular integral and singular integrals. CO 2 - To learn some methods to solve the problems of non-linear first Order Partial Differential Equations. CO 3 - To analyze homogeneous and non-homogeneous linear partial differential equations with constant coefficients and solve related problems. CO 4 - To solve the boundary value problems for the heat equations and the wave equations. CO 5 - To apply the concepts and methods in physical processes like heat transfer and electrostatics.
273	PM1724	Core VIII: Graph Theory				☑	PO 2 - To relate the theory and practical knowledge to solve the problems of the society. PO 3 - To prepare successful professionals in industry, government, academia, research, entrepreneurial pursuits and consulting firms. PO 4 - To face and succeed in high level competitive examinations like NET, GATE and TOFEL. PO 5 - To carry out internship programmes and research projects to develop scientific skills and innovative ideas. PO 7 - To prepare expressive, ethical and responsible citizens with proven expertise.	PSO 1 - To have a strong base in theoretical and applied mathematics. PSO 2 - To sharpen their analytical thinking, logical deductions and rigor in reasoning. PSO 3 - To understand the tools required to quantitatively analyze data and have the ability to access and communicate mathematical information. PSO 4 - To write proofs for simple mathematical results. PSO 5 - To acquire knowledge in recent developments in various branches of mathematics and participate in conferences / seminars / workshops and thus pursue research. PSO 8 - To use the techniques, skills and modern technology necessary to communicate effectively with professional and ethical responsibility.	CO 1 - To recall the basic definitions and fundamental concepts of graph theory. CO 2 - To identify cut vertices and understand various versions of connectedness of a graph. CO 3 - To solve problems involving connectivity and colorings of vertices and edges. CO 4 - To understand the concepts of Digraphs, Geodetic Sets, Matchings, Factorization, Hamiltonian, decompositions and Graceful labelling of a graph. CO 5 - To cite examples of planar and nonplanar graphs, learn necessary conditions for planar graphs. CO 6 - To determine the Ramsey number of certain graphs and identify the center of a graph. CO 7 - To modify the methods involved in the proof of certain theorems.
274	PM1725	Elective II: a) Classical Dynamics				☑	PO 2 - To relate the theory and practical knowledge to solve the problems of the society. PO 3 - To prepare successful professionals in industry, government, academia, research, entrepreneurial pursuits and consulting firms. PO 4 - To face and succeed in high level competitive examinations like NET, GATE and TOFEL. PO 5 - To carry out internship programmes and research projects to develop scientific skills and innovative ideas. PO 6 - To utilize the obtained scientific knowledge to create eco-friendly environment. PO 7 - To prepare expressive, ethical and responsible citizens with proven expertise.	PSO 1 - To have a strong base in theoretical and applied mathematics. PSO 2 - To sharpen their analytical thinking, logical deductions and rigor in reasoning. PSO 3 - To understand the tools required to quantitatively analyze data and have the ability to access and communicate mathematical information. PSO 4 - To write proofs for simple mathematical results. PSO 5 - To acquire knowledge in recent developments in various branches of mathematics and participate in conferences / seminars / workshops and thus pursue research. PSO 7 - To understand the applications of mathematics in a global, economic, environmental, and societal context.	CO 1 - To recall the concepts of Newton's laws of motion, momentum, acceleration, motion of a particle. CO 2 - To understand the generalized co-ordinates of the Mechanical system. CO 3 - To apply D'Alembert's Principle to solve the problems involving system of particles. CO 4 - To solve the Newton's equations for simple configuration using various methods. CO 5 - To transform the Lagrangian equations to Hamiltonian equations. CO 6 - To define the canonical transformations and Lagrange and Poisson brackets. CO 7 - To evaluate the system of particles by deriving the Jacobi equation and Jacobi's theorem. CO 8 - To understand the foundation of Hamilton's Principle and differential forms.
275	PM1726	Elective II: b) Differential Geometry				☑	PO 2 - To relate the theory and practical knowledge to solve the problems of the society. PO 3 - To prepare successful professionals in industry, government, academia, research, entrepreneurial pursuits and consulting firms. PO 5 - To carry out internship programmes and research projects to develop scientific skills and innovative ideas. PO 6 - To utilize the obtained scientific knowledge to create eco-friendly environment.	PSO 1 - To have a strong base in theoretical and applied mathematics. PSO 5 - To acquire knowledge in recent developments in various branches of mathematics and participate in conferences / seminars / workshops and thus pursue research. PSO 7 - To understand the applications of mathematics in a global, economic, environmental, and societal context. PSO 9 - To develop proficiency in analyzing, applying and solving scientific problems.	CO 1 - To recall the concepts of curvature, normal, tangent, binormal and the relevant formulae. CO 2 - To analyze differential equations using Families of curves,Geodesics on a surface and orthogonal trajectories. CO 3 - To calculate the curvature , torsion of curves and surfaces and also calculate involutes, evolutes of osculating circle, osculating sphere etc. CO 4 - To explain the concepts of curves and surfaces in first and second fundamental form and Developable surfaces at high level. CO 5 - To obtain the family of curves such as parabola general equation, circles general equation etc. CO 6 - To articulate the connections between geometry and other disciplines, possibly including topology, algebra, analytical geometry and applied mathematics.

276	PM1731	Core IX: Algebra III			☑	PO 2 - To relate the theory and practical knowledge to solve the problems of the society. PO 4 - To face and succeed in high level competitive examinations like NET, GATE and TOFEL. PO 5 - To carry out internship programmes and research projects to develop scientific skills and innovative ideas. PO 6 - To utilize the obtained scientific knowledge to create eco-friendly environment. PO 7 - To prepare expressive, ethical and responsible citizens with proven expertise.	PSO 1 - To have a strong base in theoretical and applied mathematics. PSO 2 - To sharpen their analytical thinking, logical deductions and rigor in reasoning. PSO 3 - To understand the tools required to quantitatively analyze data and have the ability to access and communicate mathematical information. PSO 7 - To understand the applications of mathematics in a global, economic, environmental, and societal context. PSO 8 - To use the techniques, skills and modern technology necessary to communicate effectively with professional and ethical responsibility. PSO 9 - To develop proficiency in analyzing, applying and solving scientific problems.	CO 1 - To recall the definitions and basic concepts of field theory and lattice theory. CO 2 - To express the fundamental concepts of field theory, Galois theory and theory of modules. CO 3 - To demonstrate the use of Galois theory to construct Galois group over the rationals and modules. CO 4 - To distinguish between free modules , quotient modules and simple modules. CO 5 - To interpret distributivity and modularity and apply these concepts in Boolean Algebra. CO 6 - To understand the theory of Frobenius Theorem ,four square theorem and Integral Quaternions. CO 7 - To develop the knowledge of lattices and establish new relationships in Boolean Algebra.
277	PM1732	Core X: Topology			☑	PO 2 - To relate the theory and practical knowledge to solve the problems of the society. PO 3 - To prepare successful professionals in industry, government, academia, research, entrepreneurial pursuits and consulting firms. PO 4 - To face and succeed in high level competitive examinations like NET, GATE and TOFEL. PO 7 - To prepare expressive, ethical and responsible citizens with proven expertise.	PSO 1 - To have a strong base in theoretical and applied mathematics. PSO 2 - To sharpen their analytical thinking, logical deductions and rigor in reasoning. PSO 3 - To understand the tools required to quantitatively analyze data and have the ability to access and communicate mathematical information. PSO 5 - To acquire knowledge in recent developments in various branches of mathematics and participate in conferences / seminars / workshops and thus pursue research.	CO 1 - To understand the definitions of topological space, closed sets, limit points, continuity, connectedness, compactness, separation axioms and countability axioms. CO 2 - To construct a topology on a set so as to make it into a topological space. CO 3 - To distinguish the various topologies such as product and box topologies and topological spaces such as normal and regular spaces. CO 4 - To compare the concepts of components and path components, connectedness and local connectedness and countability axioms. CO 5 - To apply the various theorems related to regular space, normal space, Hausdorff space, compact space to other branches of mathematics. CO 6 - To construct continuous functions, homeomorphisms and projection mappings.
278	PM1733	Core XI: Measure Theory and Integration			☑	PO 2 - To relate the theory and practical knowledge to solve the problems of the society. PO 3 - To prepare successful professionals in industry, government, academia, research, entrepreneurial pursuits and consulting firms. PO 5 - To carry out internship programmes and research projects to develop scientific skills and innovative ideas. PO 7 - To prepare expressive, ethical and responsible citizens with proven expertise.	PSO 1 - To have a strong base in theoretical and applied mathematics. PSO 3 - To understand the tools required to quantitatively analyze data and have the ability to access and communicate mathematical information. PSO 5 - To acquire knowledge in recent developments in various branches of mathematics and participate in conferences / seminars / workshops and thus pursue research. PSO 8 - To use the techniques, skills and modern technology necessary to communicate effectively with professional and ethical responsibility. PSO 9 - To develop proficiency in analyzing, applying and solving scientific problems.	CO 1 - To define the concept of measures and Vitali covering and recall some properties of convergence of functions. CO 2 - To cite examples of measurable sets , measurable functions, Riemann integrals, Lebesgue integrals. CO 3 - To apply measures and Lebesgue integrals to various measurable sets and measurable functions. CO 4 - To apply outer measure, differentiation and integration to intervals , functions and sets. CO 5 - To compare the different types of measures and Signed measures. CO 6 - To construct Lp spaces and outer measurable sets.
279	PM1734	Elective III: a) Algebraic Number Theory			☑	PO 2 - To relate the theory and practical knowledge to solve the problems of the society. PO 3 - To prepare successful professionals in industry, government, academia, research, entrepreneurial pursuits and consulting firms. PO 4 - To face and succeed in high level competitive examinations like NET, GATE and TOFEL. PO 6 - To utilize the obtained scientific knowledge to create eco-friendly environment. PO 7 - To prepare expressive, ethical and responsible citizens with proven expertise.	PSO 1 - To have a strong base in theoretical and applied mathematics. PSO 2 - To sharpen their analytical thinking, logical deductions and rigor in reasoning. PSO 3 - To understand the tools required to quantitatively analyze data and have the ability to access and communicate mathematical information. PSO 6 - To utilise the knowledge gained for entrepreneurial pursuits. PSO 7 - To understand the applications of mathematics in a global, economic, environmental, and societal context. PSO 8 - To use the techniques, skills and modern technology necessary to communicate effectively with professional and ethical responsibility.	CO 1 - To recall the basic results of field theory. CO 2 - To understand quadratic and power series forms and Jacobi symbol. CO 3 - To apply binary quadratic forms for the decomposition of a number into sum of sequences. CO 4 - To determine solutions of Diophantine equations. CO 5 - To detect units and primes in quadratic fields. CO 6 - To calculate the possible partitions of a given number and draw Ferrer's graph. CO 7 - To identify formal power series and compare Euler's identity and Euler's formula.
280	PM1735	Elective III: b) Stochastic Process			☑	PO 2 - To relate the theory and practical knowledge to solve the problems of the society. PO 4 - To face and succeed in high level competitive examinations like NET, GATE and TOFEL. PO 6 - To utilize the obtained scientific knowledge to create eco-friendly environment. PO 7 - To prepare expressive, ethical and responsible citizens with proven expertise.	PSO 1 - To have a strong base in theoretical and applied mathematics. PSO 2 - To sharpen their analytical thinking, logical deductions and rigor in reasoning. PSO 3 - To understand the tools required to quantitatively analyze data and have the ability to access and communicate mathematical information. PSO 7 - To understand the applications of mathematics in a global, economic, environmental, and societal context. PSO 8 - To use the techniques, skills and modern technology necessary to communicate effectively with professional and ethical responsibility.	CO 1 - To recall the concept of the theory of probability. CO 2 - To understand the definitions and specification of stochastic processes. CO 3 - To differentiate between different states of Markov system. CO 4 - To categorize different stochastic processes such as Poisson processes, Yule- Fury processes, birth and death processes. CO 5 - To calculate residual and current life times using renewal processes. CO 6 - To select the suitable queuing model in real life situations. CO 7 - To apply the theory to create the correct stochastic model for a given problem.

#	Code	Title					PO	PSO	CO
281	PM17PR	Major: Project	☑	☑	☑	☑	PO 2 - To relate the theory and practical knowledge to solve the problems of the society. PO 3 - To prepare successful professionals in industry, government, academia, research, entrepreneurial pursuits and consulting firms. PO 5 - To carry out internship programmes and research projects to develop scientific skills and innovative ideas. PO 7 - To prepare expressive, ethical and responsible citizens with proven expertise.	PSO 1 - To have a strong base in theoretical and applied mathematics. PSO 5 - To acquire knowledge in recent developments in various branches of mathematics and participate in conferences / seminars / workshops and thus pursue research. PSO 6 - To utilise the knowledge gained for entrepreneurial pursuits. PSO 8 - To use the techniques, skills and modern technology necessary to communicate effectively with professional and ethical responsibility. PSO 9 - To develop proficiency in analyzing, applying and solving scientific problems.	CO 1 - To become aware of current research topics in mathematics and choose a new Research topic. CO 2 - To create the habit of studying Research articles in depth. CO 3 - To submit a formal report to document the outcome of the project and get practice in writing projects. CO 4 - To understand and develop mathematical concepts effectively and correlate the same to other disciplines. CO 5 - To present papers in Conferences/Workshops/Seminars. CO 6 - To apply mathematics creatively and think critically.
282	PM17S1	Self Learning Course: Algebra for SET/CSIR-NET Exam		☑			PO 2 - To relate the theory and practical knowledge to solve the problems of the society. PO 3 - To prepare successful professionals in industry, government, academia, research, entrepreneurial pursuits and consulting firms. PO 4 - To face and succeed in high level competitive examinations like NET, GATE and TOFEL. PO 6 - To utilize the obtained scientific knowledge to create eco-friendly environment. PO 7 - To prepare expressive, ethical and responsible citizens with proven expertise.	PSO 1 - To have a strong base in theoretical and applied mathematics. PSO 2 - To sharpen their analytical thinking, logical deductions and rigor in reasoning. PSO 3 - To understand the tools required to quantitatively analyze data and have the ability to access and communicate mathematical information. PSO 5 - To acquire knowledge in recent developments in various branches of mathematics and participate in conferences / seminars / workshops and thus pursue research. PSO 7 - To understand the applications of mathematics in a global, economic, environmental, and societal context.	CO 1 - To solve the problems based on vector spaces, subspaces and linear transformations. CO 2 - To understand the significant of linear independence, basis and dimensions. CO 3 - To recall matrix theory, linear equations and finding the rank and determine the determinant of matrices. CO 4 - To determine eigen values and eigen vectors and recall cayley-hamilton theorem. CO 5 - To acquire knowledge in solving problems by using matrix representation of linear transformations and change of basis. CO 6 - To differentiate various forms in matrices. CO 7 - To solve problems in inner product spaces, orthonormal basis and quadratic forms.
283	PM1741	Core XII: Complex Analysis				☑	PO 2 - To relate the theory and practical knowledge to solve the problems of the society. PO 3 - To prepare successful professionals in industry, government, academia, research, entrepreneurial pursuits and consulting firms. PO 5 - To carry out internship programmes and research projects to develop scientific skills and innovative ideas. PO 7 - To prepare expressive, ethical and responsible citizens with proven expertise.	PSO 1 - To have a strong base in theoretical and applied mathematics. PSO 6 - To utilise the knowledge gained for entrepreneurial pursuits. PSO 8 - To use the techniques, skills and modern technology necessary to communicate effectively with professional and ethical responsibility. PSO 9 - To develop proficiency in analyzing, applying and solving scientific problems.	CO 1 - To understand the fundamental concepts of complex variable theory. CO 2 - To effectively locate and use the information needed to prove theorems and establish mathematical results. CO 3 - To demonstrate the ability to integrate knowledge and ideas of complex differentiation and complex integration. CO 4 - To use appropriate techniques for solving related problems and for establishing theoretical results. CO 5 - To evaluate complicated real integrals through residue theorem.
284	PM1742	Core XIII: Functional Analysis				☑	PO 2 - To relate the theory and practical knowledge to solve the problems of the society. PO 3 - To prepare successful professionals in industry, government, academia, research, entrepreneurial pursuits and consulting firms. PO 4 - To face and succeed in high level competitive examinations like NET, GATE and TOFEL. PO 6 - To utilize the obtained scientific knowledge to create eco-friendly environment.	PSO 1 - To have a strong base in theoretical and applied mathematics. PSO 2 - To sharpen their analytical thinking, logical deductions and rigor in reasoning. PSO 5 - To acquire knowledge in recent developments in various branches of mathematics and participate in conferences / seminars / workshops and thus pursue research. PSO 7 - To understand the applications of mathematics in a global, economic, environmental, and societal context.	CO 1 - To learn and understand the definition of linear space , normed linear space, Banach Space and their examples. CO 2 - To explain the concept of different properties of Banach Spaces, Hahn Banach theorem. CO 3 - To compare different types of operators and their properties, Natural imbedding. CO 4 - To explain the ideas needed for open mapping theorem , Open Mapping theorem. CO 5 - To construct the idea of projections , the spectrum of an operator and develop problem solving skills , Matrices, Determinants. CO 6 - To learn and understand the definition of Hilbert Spaces ,Orthogonal Complements. CO 7 - To explain the concept of the adjoint of an operator, Normal and Unitary operators, Spectral Theory.
285	PM1743	Core XIV: Operations Research				☑	PO 3 - To prepare successful professionals in industry, government, academia, research, entrepreneurial pursuits and consulting firms. PO 4 - To face and succeed in high level competitive examinations like NET, GATE and TOFEL. PO 6 - To utilize the obtained scientific knowledge to create eco-friendly environment. PO 7 - To prepare expressive, ethical and responsible citizens with proven expertise.	PSO 1 - To have a strong base in theoretical and applied mathematics. PSO 2 - To sharpen their analytical thinking, logical deductions and rigor in reasoning. PSO 3 - To understand the tools required to quantitatively analyze data and have the ability to access and communicate mathematical information. PSO 6 - To utilise the knowledge gained for entrepreneurial pursuits. PSO 7 - To understand the applications of mathematics in a global, economic, environmental, and societal context.	CO 1 - To explain the fundamental concept of DP model , Inventory model and Queuing model. CO 2 - To relate the concepts of Arrow (Network)diagram representations, in critical path calculations and construction of the Time chart. CO 3 - To distinguish deterministic model and single item. CO 4 - To interpret Poisson and Exponential distributions and apply these concepts in Queuing models. CO 5 - To solve life oriented decision making problems by optimizing the objective function.
286	PM1744	Core XV: Algorithmic Graph Theory				☑	PO 2 - To relate the theory and practical knowledge to solve the problems of the society. PO 3 - To prepare successful professionals in industry, government, academia, research, entrepreneurial pursuits and consulting firms. PO 5 - To carry out internship programmes and research projects to develop scientific skills and innovative ideas.	PSO 1 - To have a strong base in theoretical and applied mathematics. PSO 4 - To write proofs for simple mathematical results. PSO 6 - To utilise the knowledge gained for entrepreneurial pursuits. PSO 9 - To develop proficiency in analyzing, applying and solving scientific problems.	CO 1 - To write algorithms for basic computing and analyse the efficiency of the algorithm. CO 2 - To use effectively algorithmic techniques to study basic parameters and properties of graphs. CO 3 - To use effectively techniques from graph theory, to solve practical problems in networking and communication. CO 4 - To apply the Algorithms in computer science , biology, chemistry, physics, sociology and engineering.

287	PM1745	Elective IV: a) Combinatorics			☑	PO 3 - To prepare successful professionals in industry, government, academia, research, entrepreneurial pursuits and consulting firms. PO 4 - To face and succeed in high level competitive examinations like NET, GATE and TOFEL. PO 5 - To carry out internship programmes and research projects to develop scientific skills and innovative ideas. PO 6 - To utilize the obtained scientific knowledge to create eco-friendly environment. PO 7 - To prepare expressive, ethical and responsible citizens with proven expertise.	PSO 1 - To have a strong base in theoretical and applied mathematics. PSO 2 - To sharpen their analytical thinking, logical deductions and rigor in reasoning. PSO 3 - To understand the tools required to quantitatively analyze data and have the ability to access and communicate mathematical information. PSO 6 - To utilise the knowledge gained for entrepreneurial pursuits. PSO 7 - To understand the applications of mathematics in a global, economic, environmental, and societal context. PSO 9 - To develop proficiency in analyzing, applying and solving scientific problems.	CO 1 - To discuss the basic concepts in permutation and combination, Recurrence Relations. CO 2 - To distinguish between permutation and combination. CO 3 - To correlate recurrence relation and generating function. CO 4 - To solving problems by the technique of generating functions. CO 5 - To interpret the principles of inclusion and exclusion. CO 6 - To develop the concepts of Polya's fundamental theorem and apply in Polya's theory of counting.
288	PM1746	Elective IV: b) Coding Theory			☑	PO 2 - To relate the theory and practical knowledge to solve the problems of the society. PO 5 - To carry out internship programmes and research projects to develop scientific skills and innovative ideas. PO 7 - To prepare expressive, ethical and responsible citizens with proven expertise.	PSO 1 - To have a strong base in theoretical and applied mathematics. PSO 3 - To understand the tools required to quantitatively analyze data and have the ability to access and communicate mathematical information. PSO 4 - To write proofs for simple mathematical results. PSO 8 - To use the techniques, skills and modern technology necessary to communicate effectively with professional and ethical responsibility.	CO 1 - To explain the fundamental concepts of coding theory. CO 2 - To analyze the fundamental problems of coding theory and the properties of specific codes. CO 3 - To translate the fundamental problems to mathematical problems. CO 4 - To construct codes by various methods for the chosen problem. CO 5 - To solve the problems by recalling the concepts of finite field, polynomial rings and finite groups. CO 6 - To apply coding theory in transmission of information in telecommunication (cell phones, data modems etc,.). CO 7 - To design simple cyclic codes with given properties.
289	PM17S2	Self Learning Course: Analysis for SET/CSIR-NET Exam	☑			PO 2 - To relate the theory and practical knowledge to solve the problems of the society. PO 3 - To prepare successful professionals in industry, government, academia, research, entrepreneurial pursuits and consulting firms. PO 4 - To face and succeed in high level competitive examinations like NET, GATE and TOFEL. PO 5 - To carry out internship programmes and research projects to develop scientific skills and innovative ideas. PO 6 - To utilize the obtained scientific knowledge to create eco-friendly environment. PO 7 - To prepare expressive, ethical and responsible citizens with proven expertise.	PSO 1 - To have a strong base in theoretical and applied mathematics. PSO 2 - To sharpen their analytical thinking, logical deductions and rigor in reasoning. PSO 5 - To acquire knowledge in recent developments in various branches of mathematics and participate in conferences / seminars / workshops and thus pursue research. PSO 7 - To understand the applications of mathematics in a global, economic, environmental, and societal context. PSO 8 - To use the techniques, skills and modern technology necessary to communicate effectively with professional and ethical responsibility. PSO 9 - To develop proficiency in analyzing, applying and solving scientific problems.	CO 1 - To recall the basic concepts of real number system, archimedian property, convergence and limit points. CO 2 - To acquire knowledge to solve problems based on compactness and connectedness. CO 3 - To understand the definitions and theorems on normed linear space and metric space. CO 4 - To evaluate simple concepts and solve problems related to continuity, uniform continuity and monotonic functions. CO 5 - To analyze the methods for solving problems in Riemann-integrals and improper integrals. CO 6 - To expand the sequences and series for the given problems. CO 7 - To compare convergence and uniform convergence and apply them in solving related problems.